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ABSTRACT

The project attempted to experimentally validate the use of tutoring and small group teaching formats as alternatives to one-to-one teaching procedures involving autistic children. Single-subject studies and experimental-control group designs were used to compare the effects of tutoring and small group teaching formats in public and private school classrooms for autistic and other developmentally disabled children. Results indicated that non-handicapped tutors can increase academic skills and manage attending behaviors in autistic peers. Results also indicated that higher functioning autistic students can be trained as effective tutors of lower functioning peers. Other research showed that small group instructional formats were superior to one-to-one instruction in terms of student performance across several curriculum areas. Small group instruction produced higher levels of teaching time, correct student responding, more teacher-to-student interactions and more student-to-student interaction than did one-to-one instruction. Furthermore, small group instruction maintained appropriate on task behavior and comparable levels of self-stimulation. Project results were disseminated in written teacher manuals, professional presentations, masters and doctoral theses, and professional journal articles. Six pages of references are provided. About half the document consists of appendices that include teacher materials, tables, and graphs. (DB)

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CLASSROOM INSTRUCTIONAL PROGRAMS WITH AUTISTIC CHILDREN:

GROUP STRUCTURES AND TUTORING MODELS

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FINAL REPORT

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Abstract

The overall objective was to experimentally validate the use of tutoring and small group teaching formats as alternatives to one-to-one teaching procedures involving children with autism. Single-subject studies and experimental-control group designs were used to compare the effects of tutoring and small group teaching formats in public and private school classrooms for children with autism and other developmental disabilities. These investigations demonstrated that non-handicapped tutors can increase academic skills in children with autism and can manage attending behaviors of their autistic peers. The results also indicated higher functioning students with autism can be trained as effective tutors of their lower functioning peers. Other research showed that small group instructional formats were superior to one-to-one instruction in terms of student performance across several curriculum areas. Small group instruction produced higher levels of teaching time, correct student responding, more teacher-to-student interactions and more student-to-student interaction than did one-to-one instruction. Furthermore, small group instruction maintained appropriate on task behavior and comparable levels of self-stimulation. Written teacher manuals developed during the program were effective in disseminating use of both tutoring and small group teaching procedures in the classrooms of other teachers. The project resulted in a number of professional presentations, masters and doctoral theses and submissions for publication in professional journals.

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INTRODUCTION

Implementation of instruction in the least restrictive environment mandated by Public Law 94-142 has increased the number of autistic and severely handicapped children served in public school settings (Mills vs. Board of Education of District of Columbia, 1972; PARC vs. Commonwealth, 1971; Wolfensberger, 1972). This influx of students into public classroom environments has underscored the need to shift from therapeutic, individual treatment procedures emphasized in institutional settings to the development of more efficient and cost-effective educational practices.

For autistic students, use of the one-to-one teaching format has become the standard approach in school settings (Hewett, 1965; Koegel, Glahn, & Nieminen, 1978; Lovaas, 1977; Metz, 1965; Risley & Wolf, 1967; Schreibman & Koegel, 1981). The one-to-one format evolved from early lab experiments and was required in order to gain experimental control. Although, it has been demonstrated to be effective, its efficiency and cost-effectiveness is questionable since most schools have too few teachers and resources available for a total commitment to one-to-one instruction. Also, some educators have suggested that many one-to-one programs focus on skills which will have little function in the child's future environment (Brown, Holvoet, Guess, & Mulligan, 1980; Brown, Nietupski & Hamre-Nietupski, 1976; Donnellan, 1980). In current educational settings behaviors learned in one-to-one formats have not been shown to generalize to other staff or teachers. A further consideration is that one-to-one instruction may not provide the prequisite skills for effective functioning in small group situations, or for positive social interactions with peers (Brown et al., 1976; Favell,

Favell, & McGimsey, 1978). Thus, not only is the one-to-one format a costly one, but its ability to promote the integration of children into public school environments appears questionable.

Recent investigations have supported the use of other instructional formats. For example, several researchers successfully taught normal peers to model appropriate social behavior for nonhandicapped students (Campbell, Scaturro, & Lickson, 1983; Nordquist, Twardosz, & McEvoy, 1982; Peck, Apolloni, Cooke, & Raver, 1978; Shafer, Egel, & Neef, 1984; Strain, Kerr, & Ragland, 1979). Egel, Richmond, and Koegel (1981) for example, reported that the use of normal models increased discrimination skills of autistic students.

A limited number of studies have been conducted in which peers provided direct instruction to autistic children. Almond, Rodgers, and Krug (1979) taught sixth graders to tutor autistic students in preacademic skills (i.e., naming colors, numerals, shapes, and letters). Norris (1978) and Noll (1985) found that regular classroom students could be trained to teach math facts and money skills to autistic students. Schreibman, O'Neill, and Koegel (1983) reported that normal siblings could be trained to use prompting, shaping, contingent consequences, and discrete trial task presentation formats to teach academic tasks in their own home environments.

A second alternative to one-to-one instruction besides peer tutoring has been the use of small group formats. Although there are limited reports in the literature, findings suggest the feasibility of group instruction for many children. Storm and Willis (1978) found group arrangements to be effective in teaching retarded children self-help skills, compliance, play skills, and the use of tokens. Group training

was superior to one-to-one for imitative tasks. Favell, et al. (1978) reported that word recognition skills were trained as quickly in a group teaching format as in a one-to-one situation for retarded subjects. More importantly, subjects trained in a group acquired more skills in less teacher time than individually trained students.

In comparisons of one-to-one and small group training, group formats have been found to be equally effective in teaching a variety of tasks such as word recognition (Favell et al., 1978; Fink & Sandall, 1980); adjective concepts (Oliver & Scott, 1981); telephone skills (Smith & Meyers, 1978); receptive use of prepositions and color discrimination (Alberto, Jobes, Sizemore, & Doran, 1980); and picture naming (Biberdorf & Pear, 1977).

In addition to learning content objectives, other advantages reported for group strategies included: (a) observational learning from handicapped or normal peers in the group (Brown et al., 1976; Fink & Sandall, 1978; Oliver & Scott, 1981); (b) greater generalization for items taught in the group (Oliver & Scott, 1981); and (c) more rapid acquisition for higher functioning students (Frankel & Graham, 1976; Goldstein & Alberto, 1979; Westling, Ferrell, & Swenson, 1982). Although the majority of studies dealing with group teaching strategies involved retarded subjects, investigations with autistic children have suggested that teaching in a group requires gradual shaping of teacher/student ratios, while simultaneously thinning schedules of reinforcement (Koegel & Rincover, 1974; Martin, England, Kaprowy, Kilgour, & Pilek, 1968; Rincover & Koegel, 1977).

In summary, findings in the research indicated that while one-to-one instruction was an effective instructional procedure, there were

problems with its exclusive use. These problems centered on three issues (a) efficiency (b) normalization, and (c) use of school resources. First, with regard to efficiency, the one-to-one format requires that one teacher work with one student. Obviously, this is a very time consuming procedure and a very expensive form of instruction. It requires an excess of teacher time to go from student to student in a one-to-one format. Given the deficits of this population across so many areas (i.e., language, academics, socialization, motor skills, self-help, etc.) teachers cannot realistically provide enough instruction time for each student if one-to-one is the only format used. A second related problem is that as teachers work with one student, other students are left with too much independent work time or time without teacher contact. Further efficiency questions are that students may become dependent upon teacher prompts to perform, and often skills will not generalize to other persons or settings.

The second area of concern is one of normalization. One-to-one instruction is not a "normal" public school instructional routine. Few settings that disabled students are transitioned to use a one-to-one format. Furthermore, the one-to-one strategy does not allow for normalization in terms of interactions with peers. Nor does it foster incidental learning from peers.

The third issue is the use of school resources. Placement in public school and community-based classrooms has provided opportunities for students that were not available in residential or institutional settings. Alternative strategies may increase opportunities to learn and the number of activities in which students can participate in their school environments.

In view of previous research findings and the aforementioned concerns, a major goal of the completed project was to investigate alternative instructional strategies to the one-to-one format. Investigations focused on the use of peer tutoring and small group instruction.

RESEARCH OBJECTIVES

First Objective

The first objective consisted of a continuation of previous research to determine effective classroom strategies which produce significant results in terms of acquisition, maintenance, and generalization of skills for autistic and developmentally disabled subjects. Treatments were experimentally manipulated utilizing single subject designs in order to validate experimental effects across subjects and settings.

Second Objective

The second objective expanded upon Objective 1 by comparing and contrasting those techniques and strategies within various models of instructional or group arrangements. These models included one-to-one and small group instructional formats. Within the small group instructional formats a second aspect of comparison included two components: first, the teacher directly involved in instructing one student while monitoring other students engaged in independent work, and secondly, the teacher engaged in instructing students in the groups collectively or simultaneously.

Third Objective

The third objective involved a cumulative study of Objectives 1 and 2 across various content areas typically used in classroom curricula with autistic and developmentally disabled children. These content areas included training skills in language, academics, motor/recreational, socialization, and prevocational and vocational programs.

Fourth Objective

The fourth objective involved the use of peer tutoring strategies with autistic children and youth. This included demonstrating the effectiveness of the previously described objectives using regular classroom students (i.e., normal peers), and higher functioning autistic students as peer tutors in comparison with the standard procedure of the teacher/aide providing directives, instructions, and feedback.

Fifth Objective

Upon demonstration and validation of the effectiveness of strategies outlined in objectives 1 through 4, a fifth goal of the project was to develop training manuals to describe the necessary steps in implementing these procedures in public classrooms for autistic and developmentally disabled students. The manuals include sections on: (a) how to use procedures, (b) how to select appropriate students and classrooms, (c) special considerations, (d) specific steps necessary for implementation, (e) descriptions of the various procedures, and (f) methods for data collection and evaluation.

Sixth Objective

A final goal of the proposed project was validation of the training manuals through dissemination in several classrooms in the various school districts involved in the greater Kansas City area. In order to achieve this objective, project personnel functioned as consultants to participating teachers providing individual consultation and inservice training as needed to implement research programs.

METHODS

The overall objective of the project has been to experimentally validate the use of tutoring and small group formats as alternative instructional strategies to one-to-one procedures. In designing experimental procedures, the research focused on several issues. First, what kind of proof do we need to demonstrate that these alternative instructional procedures are effective ones? Second, what specific evidence do we need in terms of student and teacher performance to recommend tutoring and small groups as viable choices for classroom settings?

These issues led to the formulation of the following research questions:

1. Can normal classroom students be trained to provide peer tutoring for autistic students?
2. Which content areas lend themselves to given tutorial formats?
3. Do handicapped students show appropriate acquisition following tutoring programs, and do these skills generalize?
4. Can higher functioning autistic students be trained to provide tutoring for lower functioning peers?
5. Do tutored autistic students show appropriate acquisition following tutoring from higher functioning peers?
6. Are small group instructional formats comparable to one-to-one formats in terms of student learning?
7. Are small group formats effective procedures across several curriculum areas?
8. Are small group formats effective procedures for maintaining

appropriate student behavior, such as high rates of on task and low rates of self-stimulation?

9. Are small group formats effective in increasing the frequency of teacher-student interactions and decreasing non-instructional time?
10. Can tutoring and small group procedures be replicated successfully using written procedural manuals across teachers and students?

Subject Populations and Settings

Participants in the project consisted of students identified as autistic or autistic-like and developmentally disabled (trainable retarded). School districts included Kansas City, Missouri; Kansas City, Kansas; as well as the Sherwood Center for Exceptional Children. While school district evaluators or independent clinicians were responsible for the diagnosis of subjects, the following state/federal definitions provide characteristics for those selected.

Autism. Autism is a severely incapacitating life-long developmental disability which typically appears during the first three years of life. It occurs in approximately five out of every 10,000 persons and is five times more common in boys than girls. It has been found throughout the world in families of all racial, ethnic and social backgrounds. No known factors in the psychological environment of a child have been shown to cause autism.

The symptoms are caused by physical disorders of the brain. They must be documented by history or present on examination. They include:

1. Disturbances in the rate of appearance of physical, social and language skills.

2. Abnormal responses to sensations. Any one or a combination of sight, hearing, touch, pain, balance, smell, taste, and the way a child holds his body are affected.
3. Speech and language are absent or delayed while specific thinking capabilities may be present. Immature rhythms of speech, limited understanding of ideas, and the use of words without attaching the usual meaning to them is common.
4. Abnormal ways of relating to people, objects, and events. Typically, they do not respond appropriately to adults and other children. Objects and toys are not used as normally intended.

Autism occurs by itself or in association with other disorders which affect the function of the brain such as viral infections, metabolic disturbances, and epilepsy.

On IQ testing, approximately 60% have scores below 50; 20% between 50 and 70; and only 20% greater than 70. Most show wide variations of performance on different tests and at different times.

Autistic people live a normal life span. Since symptoms change, and some may disappear with age, periodic re-evaluations are necessary to respond to changing needs.

The severe form of the syndrome may include the most extreme forms of self-injurious, repetitive, highly unusual and aggressive behaviors. Such behaviors may be persistent and highly resistant to change, often requiring unique management, treatment, or teaching strategies. (National Society for Children and Adults with Autism, 1977).

Trainable Retarded. Students selected from this category were those identified by the school districts as exhibiting mental retardation based

upon the federal definition:

> "Mentally retarded means significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior and manifested during the developmental period, which adversely affects a child's educational performance" (PL 94-142, regulation 300.5).

Typically the specific group of retarded students identified as trainable retarded or semi-dependent (Kansas State Plan for Special Education, 1985) are those in the moderately retarded range (IQ 25-50) (Hallahan & Kauffman, 1978).

Experimental Design

The goal of educational research is to develop effective treatment packages that will produce favorable results across a population or group of students. The essential features of the experimental analysis of behavior are to compare performance under different environmental conditions to determine causality, to perform replications across subjects, and to evaluate and disseminate the results (Kazdin, 1978; Sidman, 1960). The task, then, for researchers is to select the experimental designs that best meet these goals. Single-subject designs are more appropriately used for analyzing processes (i.e., causality) and group designs for evaluating outcome (Baer, 1971; Delquadri, Greenwood, & Hall, 1981; Hersen & Barlow, 1976; Johnston & Pennypacker, 1980; O'Leary & Kent, 1973).

The general guideline would be to first develop the treatment and determine the conditions under which it is effective (Hersen & Barlow, 1976; Sidman, 1960). In order to ensure that the behavior change has not occurred by chance (i.e., determine causality), single-subject research designs are necessary (Baer, 1971; Johnston & Pennypacker, 1980; Sidman,

1960). Group means do not really illustrate that the experimenter achieved control over individual behavior (Kazdin, 1973). Additionally, group data cannot disclose or eliminate population variability. Although individual effects of a treatment may be large, inconsistency may exist due to possible interactions with the behavior and/or other variables. Individual data will reveal these effects, while averaged group data may hide them (Kazdin, 1973; 1982; Sidman, 1960). As suggested by Baer (1971), "It is in the single case that behavior resides, and so it is in the single case where it best be analyzed" (p. 365).

Another goal of educational research is that when disseminated, a treatment package can efficiently and effectively be replicated. Replication establishes the reliability of previous results and determines the generality of these results under a variety of conditions (Hersen & Barlow, 1976). "Experiments can only be repeated by other investigators if there has been a detailed description of the treatment procedure (independent variable), measurement procedure (dependent variables), and [subject] characteristics" (Leitenberg, 1973; p. 99). Single subject designs provide detailed descriptions of the above, while group designs may obscure important variables. Direct replications with single subjects also establish the beginning of generality and are more time and cost efficient than replication across groups. Additionally, replication across groups is hindered with low incidence populations (i.e., autism) (Kazdin, 1973).

There exist three commonly used single-subject designs that clearly illustrate that behavior change is a function of the experimental condition. The reversal design, (Hersen & Barlow, 1976), provides a powerful demonstration that behavior changed only when the treatment was

in effect. In this design, treatment and baseline conditions are alternately presented within a subject or group of subjects.

In the multiple baseline design, data are collected across behaviors, individuals, or settings. Causality is determined by examining the behavior across several different baselines and obtaining a clear effect of behavior change only when the treatment is introduced.

The third design, the alternating treatments design (Hersen & Barlow, 1976) employs separate interventions simultaneously but under different stimulus conditions. This design determines a functional relationship between the treatment and the behavior by illustrating that subjects perform differently under different conditions and that different stimuli exert control over the behavior.

Once causality is determined and experimental findings have been successfully replicated across subjects, experimenters should address evaluation on a larger scale. Group designs are most appropriate for this stage of research. As Baer (1971) suggested, the questions which "group designs answer are actuarial questions, not analytical ones. They do not ask how behavior works, they ask only if it will usually solve the referring problem" (p. 365). Group designs answer many questions that a practitioner or social agent might ask. First, it is important to determine how effective a treatment package is relative to traditional techniques (Kazdin, 1973). Second, it is important to determine what percentage of the population will benefit when it is applied to the group (Hersen & Barlow, 1976; Johnston & Pennypacker, 1980; O'Leary & Kent, 1973). In summary, consumers are primarily interested in what treatment will effect the greatest number of students with the least cost in time, money, and personnel (O'Leary & Kent, 1973).

The research designs within specific components in this project were selected based upon these considerations. Generally, causality with replication was determined through single-subject research, while group studies were used to determine applicability outcomes for larger numbers of teachers and students.

Instrumentation

Dependent and independent measures required for experimental validation of project activities consisted of student, teacher, and eco-behavioral assessment of the interaction of all variables within classroom environments. The following listing provides a description of the measures.

1. Acquisition Probes. For some of the research studies, probes were collected on student learning on an ongoing basis (minimum of once per week). Acquisition probes consisted of presentation of a standard list of items (10-20) to students immediately following instructional sessions to measure learning. As students in different groups and of different functioning levels were instructed on different materials, the acquisition probe lists were individualized to match the curriculum. Samples included standardized word lists, math facts, reading passages, picture cards for identification, or a list of verbal commands for imitation. Student scores of correct/incorrect responses allowed for ongoing measurement of learning and provided feedback on the effectiveness of the instruction.

2. Criterion-Referenced Skills Tests. These measures consisted of individualized sets of items encompassing units or segments of a curriculum content area. Teachers and experimenters designed these skills tests based upon segments of the curriculum that were covered over

longer periods of time. Tests were individualized based upon the functional level curriculum used within the special education programs. These tests were administered on a pre-post basis to measure student acquisition and advancement through selected curriculum components. Sample criterion-referenced skills tests are provided in Appendix A.

3. On task/Self-stimulatory Student Behavior. Data were collected on student behaviors using a 15-second momentary time sampling procedure in which both behaviors were scored simultaneously during instructional sessions. On task behavior was scored at the end of intervals in which the students were observed looking at the person giving the instruction, at a peer responding, at materials, or responding to trainer prompts or questions. Self-stimulatory behavior was scored at the end of intervals in which body-rocking or jerking, facial tics and repetitive gestures, perseverative vocalizations or laughing, or inappropriate smelling or touching of persons/objects occurred.

4. Teacher Observation Form. The teacher observation form was used to record teacher behavior and student performance during instructional sessions. Categories of behaviors on the form included the number of trials presented; the number of correct or incorrect responses; and the number of models, prompts, reinforcing statements, and feedback/behavioral management presented by the teacher. Definitions of the specific categories and a sample recording form are provided in Appendix B. Data using the form were collected using a continuous recording procedure for 5-15 minute samples during the instructional sessions.

5. Teacher Checklist. The teacher checklist was used as a monitoring instrument designed to correspond to the Teacher Training

Manual developed by the authors. The teacher checklist provided a 1-4 rating scale for specific corresponding categories which were scored following observation of group teaching sessions. These categories included: (a) presentation of discrete trials, (b) maintenance of student attention, (c) adequate array of materials, (d) appropriate seating arrangements, (e) distribution of trials among students, (f) provision of incidental learning opportunities, (g) correction procedures incorporated, and (h) maintenance of appropriate student behaviors. A copy of the Teacher Checklist is provided in Appendix C.

6. Teacher/Consultant Satisfaction Survey. A satisfaction survey was used with teachers and consultants who participated in research activities (See Appendix D). This instrument, using a 1 to 5 Likert Rating Scale provided participants with an opportunity to comment on group teaching procedures and to provide suggestions for future implementation. Categories included preparation time requirements, academic benefits to students, academic benefits compared to one-to-one formats, student behaviors in groups, and considerations for future use.

7. Teacher/Student Interaction Probes. Frequency counts were collected on the number of teacher-to-student interactions during instructional sessions. These data were derived by counting the number of tallies across all categories represented on the teacher observation form.

8. Student/Student Interaction Probes. Frequency counts were collected on the number of student-to-student interactions which occurred during instructional sessions. These data were derived by counting the number of tallies recorded during session observations.

9. CISSAR-SPED (Code for Instructional Structure and Student

Academic Responses-Special Education: Rotholz et al., 1985). This final measure is a code designed for ecobehavioral assessment of special education classrooms and is based on the original CISSAR code developed by Greenwood and associates at the Juniper Gardens Children's Project (Greenwood, Delquadri, & Hall, 1984; Stanley & Greenwood, 1981). Use of the CISSAR code by these researchers has provided examples of how eco-behavioral assessment has led to the discovery of variables affecting the learning of regular education, learning disabled, and mentally retarded students. The code was developed to provide both a measure of instructional context and/or ecology and student academic response. Using an interval recording technique, the code enables recording of six major code categories with 53 separate codes. The six categories include (a) activities--the subject of instruction (12 codes), (b) curriculum task types (8 codes), (c) structure--grouping (3 codes), (d) teacher position with respect to the target student (6 codes), (e) teacher behaviors (5 codes), and (f) student behavior (19 codes).

Interobserver reliability on the CISSAR codes have been computed using both percent agreement and Pearson correlation methods. Agreement scores have been computed separately for the six major code areas (e.g., activities, tasks, etc., as well as an overall score). These agreements over 190 checks made by 10 observers averaged 99% (SD=4.17) for activities, 97% (SD=7.46) for tasks, 99% (SD=2.85) for structure, 94% (SD=8.00) for teacher position, 92% (SD=8.67) for teacher behaviors, and 86% (SD=11.70) for student behaviors. The overall agreement average was 92% (SD=6.32) and ranged from 70% to 100%.

While the CISSAR code is an excellent tool for assessing regular educational settings, we found that a revision was necessary to

adequately address the ecological and behavioral assessment needs of classrooms for special education population students. These needs, as differentiated from those of regular classrooms reflected differences in physical and instructional grouping, identification of multiple teachers (aides and peer tutors) who would provide instruction to target students, and the opportunity for coding multiple responses across the categories of academic responses, task management behavior, and inappropriate/ competing behavior.

The revision of the CISSAR code developed for assessment of special educaton settings, CISSAR-SPED, is comprised of 73 codes within three main composite areas of ecological structure and teacher and student behavior. These three areas include: (a) instructional structure (34 codes), (b) teacher data (26 codes), and (c) student behavior (23 codes). Ecological events (as in the CISSAR code) were defined as the specific joint occurrences of certain major events (e.g., ecology and teacher data). These seven events include: (a) activities (16 codes) - the subject of instruction being provided to the student, (b) task (10 codes) - the curriculum task or verbal instruction mode in which the student is expected to engage, (c) physical structure (3 codes) - the physical grouping, (d) instructional structure (5 codes) - the instructional format in which the target student is engaged, (e) teacher description (5 codes) - description of the person providing instruction to the target student (i.e., teacher, aide, peer tutor, other), (f) teacher position (5 codes), and (g) teacher behavior (6 codes). These categories provide for a wide representation of ecological contexts within the coding system.

Student behavior is represented by 24 individual codes and three

composites. The composites include: (a) academic responses, (b) task management behavior, and (c) competing behavior. The academic response composite consists of nine codes: eight behaviors in which the student could be actively engaged (i.e., writing, playing academic game, reading aloud, reading silently, talking appropriately, answering academic question, asking academic question, and task participation), and one code to indicate the absence of an academic response (i.e., "none"). The task management composite is defined by five behaviors (i.e., waiting, raising hand, looking for materials, move to new location, and playing appropriately) and one code to indicate the absence of a task management behavior ("none"). The competing behavior composite is comprised of eight behaviors (i.e., disrupt, play inappropriate, inappropriate task, talk inappropriate, inappropriate locale, looking around, self-stimulation, and self-abuse) plus a code to indicate no competing behavior ("none"). A listing of categories within the CISSAR-SPED code is provided in Appendix E.

Use of the CISSAR-SPED code involves a 10-second time sample procedure. This is facilitated by an audible (to observer only) sound from an electronic timer housed within a clipboard. Since it was necessary for the observers to observe a student exactly on cue (i.e., every 10 seconds) and to record data in several categories, each observer collects data on only one student at a time. At the first signal the observer scores the string containing the codes for activity, task, physical structure, and instructional structure. Ten seconds later the teacher description, teacher position, and teacher behavior are scored. If a person other than the head teacher (i.e., aide, peer tutor, etc.) is providing instruction to a target student at the time of the

audible signal then teacher description, position, and behavior are coded for both the head teacher and the other person. At the time of the third signal (20 seconds after the first signal) student behavior is scored. This includes academic responses, task management behavior, and inappropriate/competing behavior. Thus, the 30-second cycle allows for repeated measurement of the three composites (i.e., instructional structure, teacher behavior, and student behavior).

The observers selected were community persons who had completed high school. Applicants were screened using (a) the Snellen Visual Acuity Test (Anatasi, 1961, p. 368), (b) the Wide Range Achievement Test, Level II, Reading and Math, and (c) personal interview.

Selected trainees learned to use the CISSAR-SPED system in a 10 day workshop, four hours each day. Early training focused on learning definitions. As mastery exams were passed on definitions, observers were taught to use CISSAR-SPED coding forms and practice coding role-played and video taped classroom events. Once observers produced 3 useable coding segments (above 80% agreement), coding was initiated in the public schools and continued for several of the research studies.

Definitions of Instructional Arrangements

The objectives and activities in these research studies investigated the use of specific strategies within various instructional arrangements. For purposes of clarity, the following definitions are provided so readers may understand instructional formats which are referred to throughout this report.

1. One-to-one Instruction. Most of the research conducted with autistic youth has been done using this instructional format. During

one-to-one sessions the teacher/aide sits with individual students to teach tasks using a discrete trial format. Since the instruction is provided to only one student at a time, other students are engaged in independent work or monitored by a second staff person. The discrete trial format represents the "state-of-the-art" in this area. As outlined by Koegel et al. (1978), the discrete trial consists of the following sequence of behaviors: (a) a clear, appropriate discriminative stimulus delivered when the child is attending; (b) shaping of the desired response by gradually fading prompts; and (c) unambiguous and effective consequences delivered immediately following the student's response. As such, there is a distinct beginning and end to the discrete trial.

2. Individual Instruction in a Group (3-6 students). In this situation, a teacher continues to instruct a student using the one-to-one format with discrete trial presentation. However, concurrently, he/she is supervising other students in a group seating arrangement, reinforcing these children for working independently, and delivering other behavior management contingencies as necessary. The teacher must be skilled in keeping all students actively engaged while rotating direct instructional sequences among the students.

3. Collective Instruction in a Group (3-6 students). Similar to Level 2, this instructional arrangement requires that the teacher maintain active engagement by a group of students. However, this level differs in that the teacher is now instructing all students simultaneously. In other words, following the discriminative stimulus delivered by the teacher in discrete trial format, all students are expected to make a response. This paradigm offers the initial

approximation to regular classroom instruction, approximation in that the teacher-to-student ratios are much smaller than one typically finds in the regular class setting.

4. Combined Individual and Collective Instruction in a Group (4-6 students). This instructional arrangement combines both individual and collective instruction. In this situation, the teacher uses a discrete trial format to alternate trials to individual students, and uses trials where all students are expected to respond collectively. This is a particularly useful arrangement because it allows for some individualization of tasks so the group can include high and low functioning students. In addition, this arrangement allows for modeling of skills by peers and thereby provides opportunities for incidental learning to occur.

Teacher Training Manuals

During the first two years of the project, research staff developed several "how to manuals" in order to more effectively train teachers to implement tutoring and group formats. This section describes the teacher manuals developed and subsequently used in carrying out several investigations.

1. Tutorial Models with Autistic Children: Increasing Academic Skills with Regular Classroom Students as Tutors. This 31-page manual describes procedures for training nonhandicapped students to act as peer tutors for autistic and developmentally disabled children. The narrative describes steps for: (a) selection of tutors and scheduling sessions, (b) discussion of characteristics of youngsters with handicaps, (c) student introductions and assignments, (d) group and individual tutor training, and (e) materials preparation. The tutor training sequence includes ideas for role-playing, practice, and feedback in several skill areas for the tutors: (a) how to give directions, (b) how to reinforce, (c) how to provide corrective feedback, and (d) how to deal with inappropriate behaviors. The manual provides numerous examples of tutoring behaviors in various situations and sample activities. The last section of the manual describes procedures for monitoring the program and collecting data on academic performance/acquisition.

2. Peer Tutoring Between Students with Developmental Disabilities: Procedures Manual. This 26-page manual describes a program to train students with handicaps to provide one-to-one tutoring to their classmates. The preliminary steps described include: (a) selection of appropriate students, (b) seating arrangements, (c) selection of task, (d) materials preparation, (e) scheduling material rotation sequence, and

(f) time considerations. A detailed training program is outlined to teach tutoring skills. It consists of a seven step instruction sequence: (a) read instruction card to tutee, (b) wait for tutee to respond, (c) praise tutee if correct, (d) turn over card, (e) discriminate between correct/incorrect, (f) model correct response and say "do this", and (e) indicate end of session (i.e., "We are finished."). Teacher procedures and monitoring ideas are provided including data evaluation forms. Vignettes are also provided describing actual tutoring sessions and sample tasks. A final section describes potential variations as well as benefits of using the program.

3. Group Instruction Procedures for Students with Autism and Developmental Disabilities: Teachers Manual. This 39-page manual describes procedures for implementation of small group teaching formats within special education classrooms. Manual components consist of (a) introduction describing the rationale and benefits of group teaching; (b) appropriate curriculum selection and modifications; (c) group formats including individualized, collective, and incorporation of peers; (d) group teaching procedures and techniques such as trial presentation, pacing, order and sequence of presentation, correction procedures; (e) management of student behaviors in the group; and (f) physical arrangements. The final section of the manual provides vignettes of several group teaching situations describing application of manual contents.

SUMMARY OF RESEARCH STUDIES

Over the course of the three year project eleven formal research studies were conducted to comply with program objectives. Seven of the studies implemented single-subject designs to analyze and experimentally validate instructional procedures, (i.e., tutoring and small group arrangements.) Four of the studies were implemented using experimental-control group designs to verify the instructional procedures with larger groups of subjects.

The following narrative presents a description of each of the studies completed and a discussion of the overall conclusions from the research activities conducted during the project period.

Study 1: Doubling Teacher Efficiency: Practical Individualized Instruction in a Group Format For Autistic Children.

This study compared the effects of different instructional structures on the rate of work completed and work completed correctly by three autistic (autistic-like) children in a public school classroom (U.S.D. 500, Kansas City, KS). Sessions, 30 minutes in length, were conducted three to four times per week by the classroom teachers. Data were collected on ten tasks divided among the children and are presented in summary form, with each graph representing the total amount of work completed per session (see Appendix F). Additionally, all data are presented in terms of the amount of work completed per 30 minutes of teacher time.

Baseline consisted of the pre-existing structure, with the two teachers spread out across the room, providing 30 minutes of 1:1 instruction to two children while the third worked independently (60 minutes of teacher time). Structure 1 involved a reallocation of

teacher time, with each child receiving 10 minutes of 1:1 instruction and 20 minutes of independent worktime (30 minutes of teacher time). Structure 2 also involved the same allotment of teacher time, however this was provided by only one teacher and the physical arrangement was changed to that of a group (all seated at one table) to facilitate this arrangement.

Interobserver agreement was assessed for each child and task in all phases of the study by having a second observer independently score the dependent measures for each child. The number of agreements was then divided by the total number of trials and multiplied by 100. The range of reliability scores was 82-100% with a mean of 94%.

Results, displayed in an ABACAC reversal design, demonstrate that the dependent measures of work completed and work completed correctly per 30 minutes of teacher time increased significantly during each of the intervention phases. These levels also decreased significantly during the reversal phases, verifying the treatment effects.

This study demonstrated the effectiveness of a method for increasing teacher efficiency. By reallocating the amount of individual instruction and independent work provided to the students, it was possible to reduce the total amount of teacher time from 60 minutes to 30 minutes. It was also possible to have one teacher provide the instruction instead of two.

The most significant finding was that the rate of work completed per 30 minutes of teacher time increased significantly under both Structure 1 and Structure 2 conditions. Additionally, for two of the three children, Structure 2 (one teacher) produced higher rates of responding than did Structure 1 (two teachers). Thus, the required

amount of teacher time was reduced by 50% while student performance increased significantly.

The procedure utilized in this study may provide teachers with a method for increasing the efficiency of their teaching time by incorporating structured small group formats. This is especially relevant with respect to the amount of learning time necessary to overcome the skill deficits of many autistic and other developmentally disabled students.

Study 2: Teacher Implementation of a Group Instructional Procedure with Autistic Youth: Training Language and Social Interactions within a Leisure Skill Activity.

This study investigated the effects of a social skill training package for teaching a card game to three autistic adolescents in a private day school setting. Experimental conditions consisted of the original classroom structure, group seating, and card game alone. These changes without instruction showed minimal effects on participants' social and verbal skills.

The training package consisted of group instruction of the card game, including models, prompts, and praise for appropriate interactions. Skills required for the game were analyzed into 15 steps:

Shuffle cards
Deal 7 cards to player one
Deal 7 cards to player two
Deal 7 cards to self
Place deck face down on rug
Turn over first card, place next to deck
Put cards in hand, facing inward

TAKE TURNS CLOCKWISE

Put matching card from hand to discard pile.

Say "It's your turn_____" (or approximation) to child on left.
If no matching card, pick up card from discard pile and put in hand.
Continue sequence until card matches discard pile.
Place matched card on discard pile.
Say "It's your turn_____" (or approximation) to child on left.
Teacher sits with students for 10-20 minutes daily to play UNO.
Teacher gives verbal prompts or gestures to help them play.

Dependent measures consisted of student verbal initiations, student verbal responses, teacher verbal prompts, and teacher verbal praise. Interobserver agreement for these measures ranged from 50 to 100% with means of 87.7, 92.4, 86.9, and 89.4, respectively.

The training package using a small group instructional format was demonstrated to be effective in acquisition of game skills and increases in student verbalizations. Results are graphically presented in Appendix G. A multiple baseline design across participants demonstrated that the increase in social skills was due to the training package. However, generalization did not occur to untrained settings.

Study 3: Increasing Academic Skills of Students with Autism Using Fifth Grade Peers as Tutors.

This study investigated the use of regular fifth grade students as tutors for elementary aged autistic students in a self-contained public school classroom. A multiple baseline design across three tasks was used to verify academic learning for two students in the areas of math, language, and reading. The tutor training program consisted of: (a) discussion of autism, (b) introduction and selection of autistic student as tutee, (c) selection of task, (d) presentation of materials and instructional techniques, (e) discussion of reinforcement and corrective feedback, and (f) modeling of tutoring session. Following training, the nonhandicapped students conducted 30-minute tutoring sessions for their autistic peers three mornings per week on selected tasks. Individual

and group feedback for the tutors and tutees was given to students intermittently throughout the course of the program.

Results from the data collected for the two autistic subjects indicate that regular classroom students can be trained as effective tutors (see Appendix H). Successful learning or increases in learning of academic behaviors were demonstrated by both subjects across all three tasks (i.e., math, expressive language, and oral reading skills).

Subject one, a nine year old male, showed improvement in three skills upon implementation of the peer tutoring sessions: (a) identification of coins and the values of various coin combinations, (b) verbal responses to questions regarding the tutoring activities, and (c) increases in the number of correct words read orally during two-minute samples. Likewise, improvement was noted for subject two, who was eleven years old. Following initiation of peer tutoring he (a) showed increases in stating the value of various coin combinations, (b) was able to verbally express opposites, and (c) increased the number of correct words read during two-minute samples. Interobserver agreement for subject one was 97% over eight sessions, and 99% over nine sessions for subject two.

This study demonstrated that nonhandicapped peers can effectively tutor autistic students in several academic areas. The tutoring sessions allowed students to receive 20 minutes of instructional time on a one-to-one basis with a peer and 10 minutes of social interaction time with their peers. In addition to the 30-minute tutoring sessions, three times per week, the program provided other benefits. The regular classroom students also served as volunteers on frequent community outings and also set an example to other students in the building by initiating contacts with the

autistic students during lunch and other school-wide activities.

Study 4: Peer-mediated Instruction Between Autistic Students: Tutor Training and Tutor Effectiveness.

Peer tutoring interventions have been demonstrated with nondisabled and disabled peers, however, few have offered an analysis of the salient training components employed to teach tutoring skills (i.e., specification of teacher-time required, components of training, and efficacy of peer tutoring research). This study outlined the technology employed in training an autistic student to function as a tutor for an autistic classroom peer. Employing a multiple baseline design across steps of a tutor training program, the tutor was required to conduct increasingly more complex discrete trial tutoring sessions. The tutor training program was comprised of seven components: (a) reading the command while oriented toward a peer, (b) waiting for the peer's response, (c) praise tutee for correct response, (d) prepare for subsequent command by turning card over, (e) discriminate between correct/incorrect response, (f) model correct behavior following incorrect response, and (g) informing the teacher when tutoring session was completed. Criterion was met for each tutoring component when the tutor responded with 80% or better accuracy following the fading of teacher prompts.

The results of this study indicate that the tutor training program was successful in teaching an autistic adolescent to conduct discrete trial sessions with a classroom peer. During baseline, the tutor read the command cards aloud to himself, or directed the command to an adult. Following the training program, consisting of feedback and prompts, the tutor learned each of the steps comprising the training program.

Reliability was recorded by the teacher and the experimenter on a trial-by-trial basis. Interobserver reliability was 90% or better at all times with a mean of 96%.

This study was initiated in a self-contained classroom for autistic adolescents. Although the students spent the majority of their time with each other they rarely interacted during academic or free-time activities. The tutoring program enabled the students to interact with each other without the teacher functioning as the primary agent.

This study demonstrated that the tutor training program was effective in teaching tutoring skills to an autistic student. Following the tutor training study, generalization and maintenance of the tutor's skills were investigated. In this second component, percent correct responding on the tutoring step was assessed using three tasks (a) open the container, (b) shake the popcorn, (c) stamp the envelope. The tutor's scores on the tutoring steps maintained or increased following the introduction of the tasks.

The tutee's acquisition was also assessed during this second phase of the study. Following baseline, the tutor taught the three tasks. Using a multiple baseline design across tasks, the tutee met criterion on each of the three tasks. These results indicate that the tutor maintained the tutoring skills he had previously learned, and used those skills to instruct his peer in three prevocational skills (see Appendix I.)

Study 5: The Effects of Vocational Training Using A Group Format on Work Production and Work-Related Behaviors for Autistic-like Adolescents.

This study compared several levels of group instruction and generalization in a work activities setting. The experimental conditions

consisted of: (a) baseline probes to determine pre-training skills, (b) intervention phase consisting of 1:6 collective instruction in group, and (c) generalization of skills to simulated conditions with 12 participants.

A within-subject multiple baseline design was used to compare the instructional outcomes across three vocational tasks. This study was conducted within a work activity center which serves autistic and severely behavioral disordered students in the Kansas City, Kansas public school district. This setting serves as a transition placement into a sheltered workshop in the community.

The 1:6 collective instructional arrangement involved the teacher in collectively instructing six students in the class in the same content area or task. This strategy approached the least restrictive instructional model, in that the entire class was receiving instruction simultaneously. This model is the closest approximation to the regular classroom model of the teacher instructing the entire class, while all students are attending to the teacher. This format provides concurrent opportunities to respond actively for each student. The generalization component within the workshop setting was the closest approximation in the public school to the sheltered workshop environment the students are referred to after graduation.

Dependent measures included on task behavior, work production rates, work related behaviors, and the Enthusiasm Scale Scores. Five of the six subjects learned at least two of the three vocational tasks presented. Two subjects approached norm levels of work production (see Appendix J.) Thus, the group training procedures were not only effective in teaching vocational tasks, but also generalized to the simulated work environment.

Study 6: A Comparison of Individualized and Collective Instruction in Small Group Formats With Autistic and Developmentally Disabled Students.

This study compared the efficiency and effectiveness of one-to-one instruction to that of two types of small group formats, (i.e., individualized instruction in a group and collective instruction in a group). Four students participated in the study. Three were identified as autistic and one was identified as mentally retarded with autistic behavior. Students were enrolled at the Sherwood Center for Exceptional Children, a private day school setting for severely handicapped youngsters.

Teaching sessions were 30 minutes in length and conducted four times weekly. Data were collected on student performance for academic tasks, academic engagement, and self-stimulatory behavior of students. Four individualized academic tasks were selected for each student. They were based on the students' individual education plans and were in the skill areas of language, math, reading, and handwriting. Data were collected on the number of trials completed, the number of correct trials, the percentage of academic engagement, and the percentage of self-stimulatory behavior.

Correct responses for each task were predetermined by the classroom teacher. Trials which required verbal responses were scored during the sessions. Trials which required written responses were scored following the sessions.

Occurrence or nonoccurrence of academic engagement was measured with a 15-second interval count (Hall, 1975) during a 10-minute segment of the sessions. It was scored as occurring if the student was actively engaged

in academic work, for example, attending to direct instruction/feedback from the classroom teacher, looking at the board to copy work, participation in verbal trials with the teacher, and writing.

Occurrence or nonoccurrence of self-stimulatory behaviors was also measured with a 15-second interval count (Hall, 1975) during a 10-minute segment of the session. It was defined as any rapid, repetitive movement of a body part (e.g., handflapping and rocking); inappropriate vocalizations; manipulation of inappropriate objects; and mouthing of inappropriate objects.

An ABACAC reversal design was used to analyze the effects of the three instructional formats. Prior to each session the classroom teacher collected word cards, alphabet cards, number cards, math fact cards, several sets of langauge pictures, worksheets, and a kitchen timer. The teacher was also given data collection sheets which listed trials that could be completed during the session.

Baseline conditions were identical to the pre-existing instructional format used in the classroom. During each baseline condition the teacher sat at her desk conducting one-to-one sessions while other students remained at their individual desks. The duration of the one-to-one sessions varied across students and sessions. No instruction was given to the teacher by the experimenters except that she limit the subject matter of the 30-minute sessions to the pool of pre-determined tasks for all students.

The individual instruction in a group condition used the same materials, presentation of trials, and tasks as in baseline. The instructional format in this condition differed only in the physical arrangement of the teacher and students. Specifically, the teacher sat in

a chair in front of the four students. The students' desks were arranged in a semi-circle approximately four inches apart. Prior to the onset of this condition the experimenters instructed the teacher to conduct one-to-one teaching sessions with one student while providing the other three students with written work.

The collective instruction in a group condition contained the same presentation of trials, tasks, and physical arrangement as those used in individualized instruction in a group condition. The materials used were identical to those used in past conditions with the addition of a large calendar. The 30-minute sessions were divided into two 15-minute segments. The teacher began the first with 1-3 minutes of simultaneous instruction with all four students in the areas of motor imitation and receptive labeling (e.g., "Everybody, do this." and "Touch your noses."). During the remainder of the 15 minutes, the teacher alternated among students, presenting from 1-4 trials of verbal tasks with one student at a time. While one student was engaged in academic instruction, it was intended that the remaining students observe the teacher or wait their turn. The students spent the final 15-minute segment completing written work. During this time the teacher circulated attention among the students, providing instruction and feedback as needed.

The results of the study indicate that both the individualized instruction in a group and collective instruction in a group produced greater amounts of completed and correct trials than were evidenced during the baseline conditions (see Appendix K). Reliability checks across all student tasks averaged 94% (164 total checks). In addition to improvements in task performance, both of the group teaching

conditions were superior to the one-to-one baseline condition in terms of increased academic engagement and decreased levels of self-stimulatory behavior. Academic engagement averaged 56% during baseline conditions, 68% during individualized instruction in a group, and 78% during collective group instruction. Self-stimulatory behavior was less than 1% during the group conditions and 5% during baseline conditions. These results suggest that small group teaching formats were superior to one-to-one formats in terms of the number of student responses, the number of correct responses, and student attending behaviors. They further suggest a more efficient use of teacher time in terms of providing more opportunities for academic responding by students and closer proximity for interacting with students on a continuous basis.

Study 7: An Alternating Treatments Comparison of One-to-One Instruction by Peers, One-to-One Instruction by Adults, and Small Group Instruction with Children with Autism.

Previous study descriptions provided evidence for the use of peer tutoring and small group teaching formats. The purpose of this study was to compare the effects of two instructional formats (one-to-one and small group) as well as to compare variations in instructional agents (peer, teacher, and classroom aide). Three autistic students participated as subjects in the study. Students were enrolled in a self-contained public school classroom in the Kansas City, Missouri School District.

An alternating treatments design with a control baseline was used to experimentally verify the effects of the instructional conditions. During Phase I, three arrangements were compared: 1:1 by peer, 1:1 by aide, and small group by teacher. During Phase II, three arrangements were also compared: 1:1 by peer, 1:1 by teacher, and small group by aide.

During both phases each condition was conducted once each morning three days per week. One-to-one sessions ran for 8 minutes, and small group sessions ran for 25 to 30 minutes. The task selected for comparison was word recognition using the Dolch Basic Sight Words. Each student was pretested prior to implementation of experimental phases. Baseline word probes (no instruction provided) were also conducted to insure that a pool of unknown words were available. Sets of 10 words were assigned to each instructional condition during experimental phases. Ten words per student were also reserved as control words with no instruction provided on the words throughout the study.

Dependent measures consisted of acquisition scores (percentage of sight words read correctly following each instructional session), percent of on task behavior, percent of self-stimulatory behavior, and incidental learning probes. In addition to student outcomes, data were collected on teaching variables during sessions. These variables included number of trials presented, number of modeled responses, number of prompts, and number of reinforcement statements delivered. Reliability for acquisition data ranged from 90-100% with a mean agreement of 99.5%. Reliability for on task behavior ranged from 75-100% with a mean of 92%. Reliability for self-stimulatory behavior ranged from 50-100% with a mean of 87%. Specific mean agreements for trials, models, prompts, and reinforcers were 97%, 97%, 89%, and 92%, respectively.

The results of the study demonstrated that peer tutoring and small group instruction by the teacher were effective alternatives (see Appendix L). One-to-one instruction was equally effective when conducted by normal peers, the classroom aide, and the classroom teacher. Small group instruction when conducted by the teacher was more effective than one-to-

one in terms of student learning. Analysis of student and teacher behaviors during the instructional arrangements indicated variance within each of the conditions. Students exhibited appropriate levels of on task and low rates of self-stimulatory behavior in the following conditions; 1:1 by peer, 1:1 by aide, 1:1 by teacher, and small group by teacher. Difficulties in student behavior were exhibited when the classroom aide began teaching the small group. This suggested a need for more intensive training. Additional positive findings for the small group format included presentation of more student trials than during one-to-one sessions, more reinforcing statements during the group, increased opportunities for student interactions, and incidental learning from peers by two of the three subjects.

Study 8: A Comparison of One-to-One and Small Group Instructional Methods Across Several Classrooms for Autistic and Developmentally Disabled Students.

This study was conducted to validate some of the group teaching issues we had investigated in the previously described single-subject studies with a larger number of students. The purpose of this study was to compare the effectiveness of one-to-one and group instructional formats with 41 students with autism and other developmental disabilities. Specifically, we wanted to find out whether students' learn in collective group instructional arrangements, whether students academic performance levels are similar in one-to-one and group arrangements, and if students exhibit differential rates of on task behavior in one-to-one and group situations. In addition, we were interested in measuring teacher behavior across instructional formats,

tasks and different student performance levels.

This study was conducted in six classrooms, three public school classrooms, a work activities center, and two classrooms in a private day school serving students with autism and other developmental disabilities. The schools were located in Kansas City, Kansas, and Kansas City, Missouri school districts. The students who participated ranged in age from 5 to 20 yrs., 18 were diagnosed as having autism and 23 as having a developmental disability.

The study was conducted for 6 weeks. During baseline, which ran for 2 weeks, all students received one-to-one instruction or independent instruction from their teachers on tasks that varied across the six classrooms. Following the baseline phase, 27 of the students (comprising the experimental group) were instructed in group arrangements, while 14 students continued to receive one-to-one instruction (control group). The one-to-one sessions were conducted for 5-8 minutes for each student, three times per week. The group session ran for 20-30 minutes three times per week.

The tasks used in the classrooms included language tasks (e.g., who, what, and where questions); money skills, which included coin usage and identification; shopping skills, in which students were taught value and prices; and readiness tasks which included object identification and counting skills.

Pre and post criterion referenced measures were taken on student acquisition of the tasks selected for their particular classrooms. Student performance during the one-to-one and group teaching sessions was also assessed. Using a momentary time-sampling device, students' rates of on task and self-stimulatory behavior were measured. The measures

collected on teaching behavior included frequency data of the number of trials, models, prompts, reinforcement, and feedback statements delivered during both the one-to-one and the group instructional formats. Reliability for measures are presented in the following table.

Table 1

Reliability Percentage Agreements Across Measures

Measure	% of Reliability Checks	Means	Ranges
On Task	50% of Observations	94%	75-100%
Self-stimulatory Behavior	50% of Observations	93%	70-100%
Number of Trials	51% of Observations	95%	60-100%
Number of Models	51% of Observations	89%	50-100%
Number of Prompts	51% of Observations	81%	0-100%
Number of Reinforcement	51% of Observations	83%	0-100%
Number of Feedback Statements	51% of Observations	94%	50-100%

The results of the experimental-control group study were encouraging. Students who received small group instruction improved in the area of task acquisition with no significant changes in behavior (see Appendix M for individual data). The experimental and control groups had similar scores on their pretests. The overall pretest score for the experimental group was 30%, and 29% for the control group. There was a 10% difference in the posttest scores of the two groups. The experimental group had an overall posttest score of 62% compared to their peers in the control group who received an overall score of 52%. An analysis of covariance was done to determine acquisition differences. Posttest scores for the groups were used as the covariate since differences were found following intervention (small group instruction).

A significant difference was found between the experimental and control groups ($F = 6.179$, $P = .017$). Table 2 summarizes the data.

Table 2

	Pretest		Posttest		F
	$\bar{X}$	sd	$\bar{X}$	sd	
Experimental (N=27)	30.37	14.71	61.96	19.79	6.179*
Control (N=14)	29.07	18.87	52.07	23.54	

*p = .017

Experimental students' on task behavior decreased slightly from the one-to-one condition to when they received group instruction. The control group's rate of on task behavior also decreased from pre to post assessment. The average rate of students' self-stimulatory behavior did not increase when they were instructed in group situations (experimental group) and increased only 1% when students remained in 1:1 instruction (control group). However, for some individual students there was a decrease in on task behavior and an increase in self-stimulatory behavior. Correlational analyses suggest a moderate inverse relationship between occurrence of self-stimulatory behavior and decrease in on task behavior, suggesting that self-stimulatory behavior and on task behavior were negatively correlated. However, the task acquisition data suggests that students learned in both the one-to-one and group instructional

formats, and that acquisition scores obtained by the students who received group instruction were significantly higher than those obtained by the students receiving one-to-one instruction exclusively. Table 3 presents a summary of student behaviors for experimental and control group students.

Table 3

	$\bar{X}$ % On Task			$\bar{X}$ % Self-Stimulatory Behavior		
	Baseline	Small Group Instruct	Difference	Baseline	Small Group Instruct	Difference
Exper (N=27)	89%	81%	-8%	15%	15%	0%
	Base 1	Base 2	Difference	Base 1	Base 2	Difference
Control (N=14)	83%	77%	-6%	19%	20%	1%

There were considerable differences for individual teachers across sessions and between teachers across classrooms in their use of trial delivery, models, prompts, reinforcement, and feedback, as well as instructional styles (round-robin, individual instruction in a group, and collective group instruction). Individual teacher data is presented in Appendix N. The variability may have been due to small sampling (5-minute probes twice per week per teacher/student). Further study is needed to determine the effects of teacher variability.

The findings of this study support our other research findings that teaching students in a group format may be an effective instructional

alternative to one-to-one instructional formats. Furthermore, group instruction was demonstrated to be more effective for task acquisition.

Study 9: A Comparison of One-to-One and Small Group Instructional Methods: Replication Using a Consultant Model.

During the final year of the project a second experimental-control group design study was conducted which compared one-to-one and small group instruction for autistic and developmentally disabled students. The purpose of this study was two-fold: (a) to see if the results indicating the effectiveness of small group teaching would replicate to other classrooms, teachers, and students; and (b) to validate teacher training through use of a school-based consultant model incorporating the group teaching manual. In the single-subject studies (1-7) and the previous experimental-control group study (Study 8) we had demonstrated that research staff could train teachers to use small group formats and that the results of the training produced significant learning for students. This study was necessary to provide field testing for our procedures and written manual. The following table presents an outline of the activities used to implement the consultant model.

Table 4

Group Teaching Study II

Outline of Activities

Week 1	Consultant Recruitment
Week 2	Teacher Recruitment
Week 3	Consultant Training I
	--Group Teaching Manual
	--Videotape
Week 4	Consultant Training II
	--Feedback
	--Group Teaching Checklist
Week 5	Teacher Training I
Week 6	Teacher Training II
Week 7	Observations/Pretests
Weeks 8 & 9	Baseline
	--One-to-One Instruction
Weeks 10-14	Group Teaching Intervention
	--Experimentals Receive Group Instruction
	--Consultants Provide Weekly Feedback
Week 15	Posttests

During the first four weeks of the study research staff recruited and trained school-based consultants in group teaching procedures. School administration, staff development specialists, and teachers participated as consultants. The consultant training consisted of (a)

presentation of group teaching procedures through use of the written manual, (b) presentation of video tapes highlighting small group teaching in previous research studies, (c) description of feedback techniques including use of a group teaching checklist (see Appendix C), and (d) written outline of responsibilities for the consultants to implement the program. During the following weeks the consultants provided training for their selected teachers. The same format (use of the group teaching manual and videotapes) was used for teacher training.

Consultants (N=4) and teachers (N=6) from Kansas City, Kansas and Kansas City, Misssouri Public School Districts as well as staff from the Sherwood Center for Exceptional Children participated in the study. Twenty-five students ranging in age from 5 to 19 years old served as subjects for the study. Fifteen were diagnosed as having autism and ten were diagnosed as developmentally disabled. Curriculum tasks included language skills, math skills, telling time, and shopping.

The instructional portion of the study was conducted for six weeks. During the two-week baseline period, all students received 5-8 minutes of one-to-one instruction on the selected tasks. During the group teaching phase (4-5 weeks), 19 of the students (experimentals) received small group instruction on the same task for 20-30 minutes. Six of the students (controls) continued to receive one-to-one instruction on the same task. All sessions were conducted three times per week.

Several measures were collected to experimentally verify the effectiveness of the procedures. Student data consisted of (a) pre and posttests on the curriculum items to measure acquisition, (b) on task behavior during one-to-one and group teaching sessions to measure student attending, and (c) self-stimulatory behavior to measure any

changes across sessions. Teacher data consisted of the number of trials, models, prompts, reinforcing statements, and behavior management statements made to students during instructional sessions. (See Study 8 for a complete description of these measures.) A final measure collected was the number of teacher-to-student and student-to-student interactions that occurred during the preassessment phase (observations of classrooms prior to study implementation), one-to-one sessions, and group teaching sessions. Reliability checks across measures are presented in the following table.

Table 5

Reliability Percentage Agreements Across Measures

Measure	% of Reliability Checks	Means	Ranges
On Task	39% of Observations	95%	71-100%
Self-Stimulatory Behavior	39% of Observations	97%	85-100%
Number of Trials	29% of Observations	96%	81-100%
Number of Models	29% of Observations	93%	67-100%
Number of Prompts	29% of Observations	81%	59-100%
Number of Reinforcements	29% of Observations	83%	50-100%
Number of Behavior Management Statements	29% of Observations	93%	58-100%
Teacher-to-Student Interactions	29% of Observations	93%	67-100%
Student-to-Student Interactions	29% of Observations	98%	81-100%

In addition to data collected during instructional programs, two additional measures were collected to provide verification of the school-

based consultant model. The first measure consisted of a pre-post check on the written manual content. This was given to consultants and teachers before and after training sessions (see Appendix P). Consultants averaged 84% correct on the pretest (range 68-95%) and 99% correct on the posttest following training (range = 95-100%). This represents an increase in content knowledge ranging from 5-27% with a mean increase of 15%. Teachers averaged 79% on the pretest (range = 63-100%) and 95% on the posttest following training (range = 89-100%). This represents an increase in content knowledge ranging from 0-32% averaging an increase of 16%.

The second measure to verify implementation of procedures was the Group Teaching Checklist (see Appendix C). This measure consisted of questions regarding the effectiveness of teacher implementation of small group formats. Sections/questions are designed to correlate to the group teaching manual (i.e., curriculum and materials, discrete trial presentation, pacing presentation, correction procedures, student management, and physical aspects of the group). Consultants completed the checklist after observing teachers in the small groups, once per week. Sixty-seven percent of the checklists were completed and turned in by the school-based consultants. A Liekert scale consisting of 1-4 with 4 being the best teacher performance for individual questions was used on the checklist. Scores averaged 3.7 - 4.0 across teachers with an overall mean of 3.9. Reliability was taken by researchers during 4 of the 16 completed checklist sessins and averaged 84%.

The results of this second experimental-control group study replicated findings of the first study in that the students who received small group instruction acquired significantly more task content knowledge than the students only receiving one-to-one instruction. The experimental group

pretest scores averaged 36% and improved to 67% on the posttest; showing an average gain of 31%. The control group pretest scores averaged 33% and improved to 48% on the posttest, showing an average gain of 15% (see Appendix Q for individual data). An analysis of covariance was completed to determine differences for the experimental and control groups. Posttest scores were again used as the covariate. A significant difference was found between the two groups ($F = 7.624$, $p = .011$). Table 6 summarizes the data.

Table 6

	Pretest		Posttest		F
	$\bar{X}$	sd	$\bar{X}$	sd	
Experimental (N=19)	35.68	15.37	67.21	19.64	7.624*
Control (N=6)	38.17	11.74	55.17	24.01	

*p = .011

A second notable difference was also found regarding student performance during instructional sessions. The experimental group's percent of correct responses during one-to-one sessions averaged 65% and improved during small group sessions/intervention to 81%, indicating an overall gain of 16% in correct responding. The control group however, performed at a rate of 72% correct during initial one-to-one sessions and only improved to 73% correct during the second phase of one-to-one sessions, indicating only a 1% gain in correct responding. These findings suggest that the small group teaching format allowed for higher

increases in correct response rates.

As in the first experimental-control group study, there were no significant differences in students' on task and self-stimulatory behaviors between the experimental (small group) and the control (one-to-one) students (see individual data in Appendix Q). The experimental group averaged 84% on task during the baseline phase and 88% during the small group phase, an improvement of 4%. The control group averaged 75% during baseline and 84% during the second one-to-one condition, an improvement of 9%. Experimental students averaged a 4% rate of self-stimulatory behavior during baseline and 9% during intervention, a slight increase of 5%. Control students averaged 11% during baseline and 7% during the second phase, a slight decrease of 4%. An analysis of covariance was done to determine differences for both behaviors. As presented in Table 7, no significant differences were found in student behaviors for the experimental (small groups) and control (one-to-one) group students.

Table 7

	On Task Behavior				
	Baseline 1		Baseline 2/ Small Group		F
	$\bar{X}$	sd	$\bar{X}$	sd	
Experimental (N=19)	84.11	20.28	87.53	10.64	.143*
Control (N=6)	75.17	16.56	84.33	17.37	

	Self-Stimulatory Behavior				
	Baseline 1		Baseline 2/ Small Group		F
	$\bar{X}$	sd	$\bar{X}$	sd	
Experimental (N=19)	4.32	6.82	8.74	13.36	.508*
Control (N=6)	10.50	20.63	7.33	7.74	

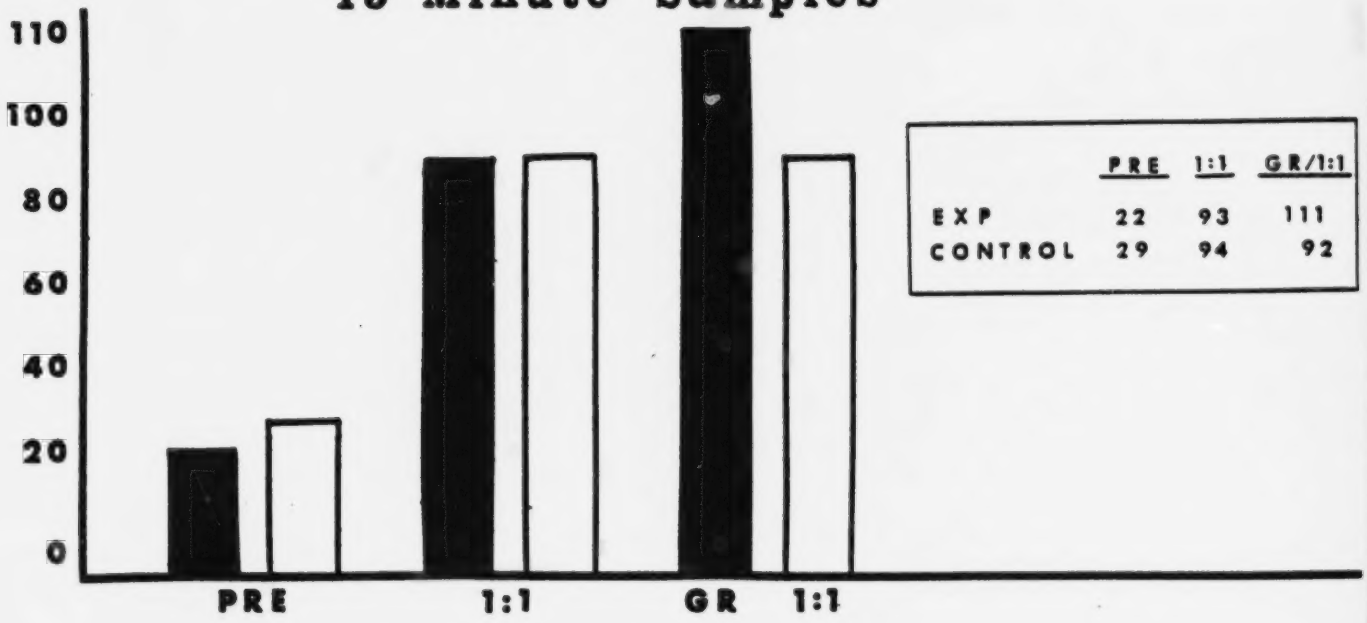
*p > .05

Further positive results were found in the study regarding teacher-to-student and student-to-student interactions. This data was collected during a preassessment phase (existing classroom conditions prior to baseline), during baseline, and during intervention phases. Findings indicate higher increases for the experimental group than for the control group. For teacher-to-student interactions the experimental group students improved from preassessment (22) to baseline (93), an improvement of +71 interactions. The experimental group additionally improved to 111 interactions during the small group intervention, a gain of +89 from preassessment and +18 from baseline. The control group students showed notable gains from preassessment (29) to the baseline 1

condition (94), a gain of +65 interactions. However, the control group evidenced a slight decrease during the baseline 2 phase (63), an average of 2 fewer interactions. These data are presented graphically in Table 8. Student-to-student interactions were low across all conditions, however the experimental group students showed a slightly higher frequency increase during the small group intervention than did the control group students who remained in one-to-one instruction.

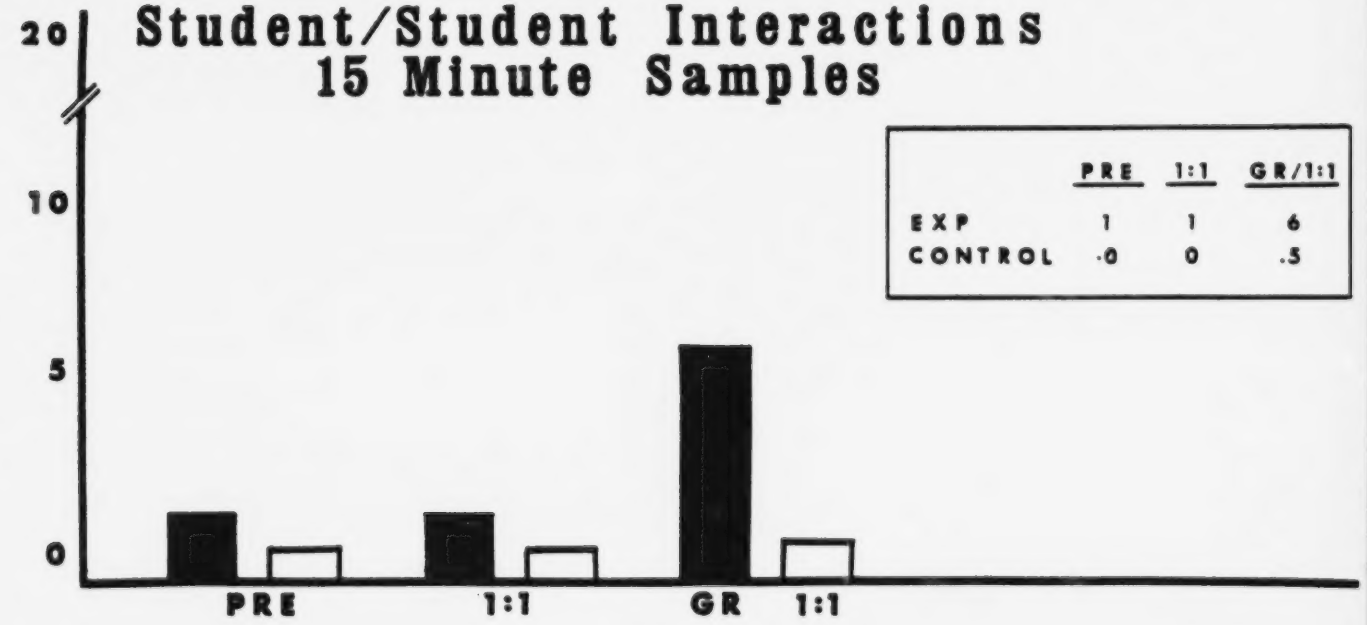
Table 8

Student/Teacher Interactions
15 Minute Samples



	PRE	1:1	GR/1:1
EXP	22	93	111
CONTROL	29	94	92

Student/Student Interactions
15 Minute Samples



	PRE	1:1	GR/1:1
EXP	1	1	6
CONTROL	.0	0	.5

PRE- PRE ASSESSMENT

1:1- ONE TO ONE CONDITION

GR- SMALL GROUP CONDITION

EXPERIMENTAL

CONTROL

There were considerable differences for individual teachers across sessions and between teachers across classrooms in their frequency of trials, models, prompts, reinforcement, and behavior management statements (see Appendix R for summary tables). Few conclusions can be drawn from this data without further study. One finding noted is that the number of trials decreased in four of the six classrooms during the intervention phase for the experimental group students. However, the number of trials presented to the control students decreased in all four control classrooms. A positive finding is that reinforcement rates improved in four of the six classrooms during the small group intervention and only improved in one of the four control classrooms. This may indicate that the small group format provides a more positive student learning environment.

Consumer satisfaction measures were collected from teachers and consultants in the study. Consultants and teachers agreed on (a) the academic benefits of group teaching, (b) the usefulness of the group teaching manual, and (c) the desire to incorporate group teaching in future situations. Slightly lower ratings were reported for (a) ability to manage student behavior in groups, (b) use of video tapes as a training tool, and (c) use of the group teaching checklist as a feedback mechanism.

These findings replicate the previously described studies in support of small group teaching formats for autistic and developmentally disabled students. Significant positive factors for using small group instruction include (a) improved task acquisition for students, (b) higher rates of correct responding during instructional sessions, (c) higher frequencies of interactions among teachers and students and (d) higher levels of reinforcement.

Study 10: Descriptive Analyses of Small Group Teaching Formats

Upon completion of the experimental-control group studies (studies 8 & 9) several research questions prompted further analysis of the data. One issue was how did IQ levels influence student performance. A second issue was to determine the relationship between curriculum area and student performance.

To investigate these issues the pre and posttest acquisition scores were pooled from both Study 8 and Study 9. Thus the total number of subjects for these comparisons was 66; experimental = 46, controls = 20.

In analyzing the IQ variable, significant differences were found for both studies and in the combined data set (Pearson Chisquare, 14.31, $p<.01$). For the experimental group (students receiving group instruction), students with IQs above 50 demonstrated higher acquisition gains. For the control group (students remaining in the one-to-one instruction format), the students with IQs below 50 demonstrated higher acquisition gains. The students with IQ scores above 50 who remained in the one-to-one format demonstrated the lowest acquisition gains, even lower than the average gains for students with IQs below 50 in the experimental group. This suggests that remaining in the one-to-one format may hinder the learning for some students. It may also reflect an overall slower rate of learning for some students. This data suggests a need for further investigation of the IQ variable, particularly since the N's for some of the groups is small. The following table presents a summary of acquisition gains for experimental and control group students based on IQ scores.

Table 9

Study 8

Experimentals				Controls			
IQ	Pretest	Posttest	Gain Scores	IQ	Pretest	Posttest	Gain Scores
<50	26.9%	54.8%	27.9% (N=16)	<50	29.2%	53.0%	23.8% (N=13)
≥50	35.4%	72.4%	37.0% (N=11)	≥50	28.0%	40.0%	12.0% (N= 1)

Study 9

Experimentals				Controls			
IQ	Pretest	Posttest	Gain Scores	IQ	Pretest	Posttest	Gain Scores
<50	33.3%	63.4%	30.1% (N=13)	<50	35.8%	53.4%	17.6% (N= 5)
≥50	40.8%	75.3%	34.5% (N= 6)	≥50	17.0%	23.0%	6.0% (N=1)

Combined Data: Studies 8 & 9

IQ	Pretest	Posttest	Gain Scores	IQ	Pretest	Posttest	Gain Scores
<50	29.8%	58.7%	28.9% (N=29)	<50	31.0%	53.1%	22.1% (N=18)
≥50	37.3%	73.4%	36.1% (N=17)	≥50	22.5%	31.5%	9.0% (N= 2)

A second analysis was completed to determine experimental and control group performance across curriculum areas. Five areas were used in studies 8 and 9: math, language, readiness/compliance skills, shopping, and telling time. Subjects pre and posttest acquisition scores were averaged across curriculum areas and are presented in Table 10. Experimental group students (those receiving group instruction) showed higher acquisition gains than the control group students (those only receiving one-to-one

instruction) across 4 of the 5 curriculum areas. The experimental group averaged a 31% gain for math and the control group averaged a 26% gain. In language, experimental group students averaged a 35% gain, while the control group only averaged a 13% gain. For readiness/compliance skills, the experimental group averaged a 32% gain and the control group 25%. A slight difference was noted for shopping tasks, the experimental group students averaged 28% and the control group 25%. The only task in which experimental group students averaged a lower gain was telling time (29%) as compared to the control (35%). However, there was only 1 control subject for that particular task.

In summary, differences were noted for both descriptive analyses of secondary variables, IQ and curriculum area. The data suggest further investigation concerning these variables.

ANALYSIS OF PRE/POST ACQUISITION BY CURRICULUM AREA

(STUDIES 8-9)

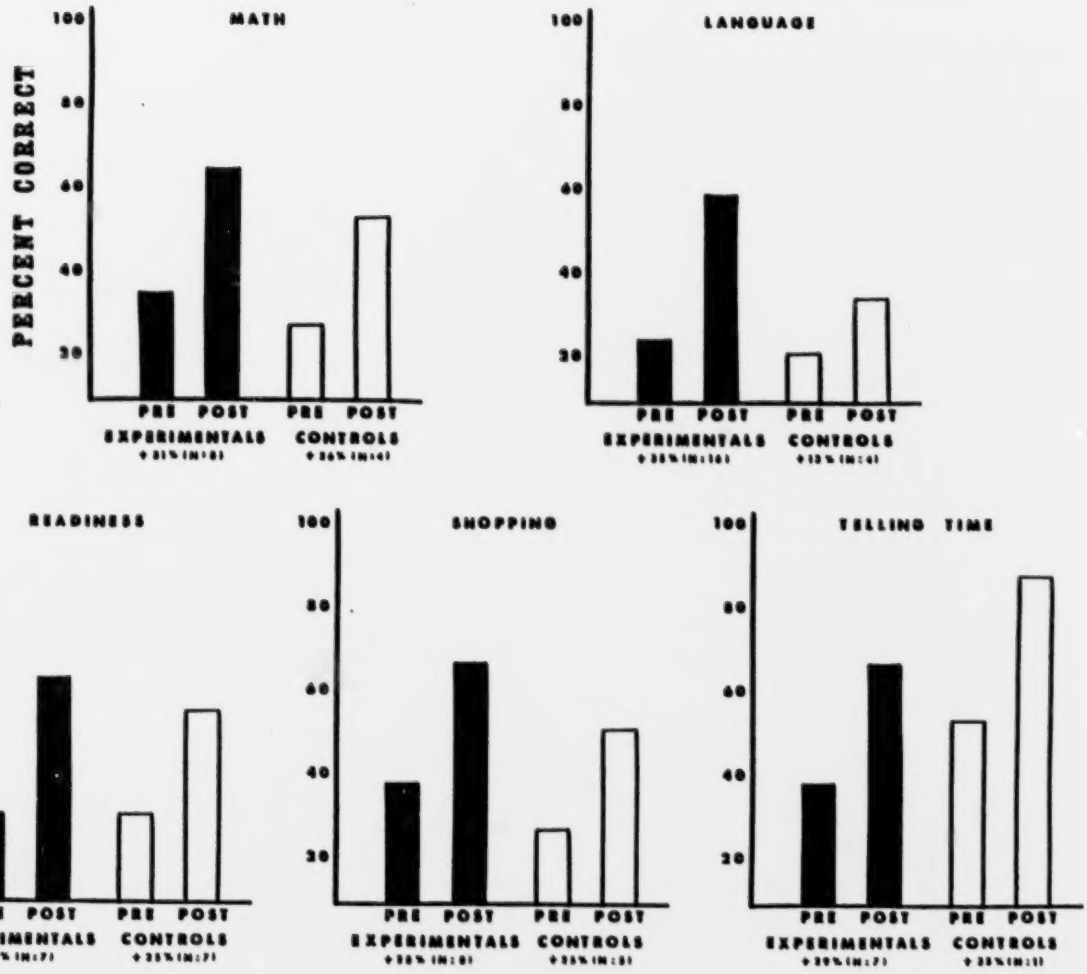


Table 10

Study 11: Ecobehavioral Analysis of the Relationship of Teaching Formats, Academic Responding, and Competing Responses with Autistic and Developmentally Disabled Students.

A final area of study for the research project was development of an ecobehavioral coding system for use in special education classrooms. A description of the CISSAR-SPED code is provided in the instrumentation section. This code was used during years 2 and 3 of the project in classrooms participating in small group instruction research. The primary purpose was development of a thorough coding system in order to (a) validate the independent variable (type of instruction), and (b) provide an accurate picture of the classrooms in terms of curriculum and structure, teacher behaviors, and student behaviors.

CISSAR-SPED data was collected for 32 students. Two to three probes were collected for each student for a total of 73 observations averaging 1 1/2 hours each. Reliability on student observations averaged from 82-99% across code categories, with an overall reliability of 91% agreement.

Analysis of the output data was conducted using a computer program to quantify and qualify interactions from students' observational records (Greenwood, Whorton, Finney, & Rotholz, 1986). The program computes: (a) the frequency and percentage occurrence of specific combinations of activities, tasks, structure, teacher position, and teacher behavior during observations; and (b) the conditional probability of student responding (i.e., academic responding, task management responding, and inappropriate responding) occurring in association with separate arrangements.

Our first analyses conducted was to verify the use of small group instruction in selected classrooms. Table 11 presents a summary of instructional arrangements by student behaviors for the experimental and control groups. These results verified small group instruction implemented for exerimentals increasing from baseline (16%) to intervention (32%). The data also indicated a decrease in one-to-one and independent activity for the experimentals and an increase in independent activities for the control group. This further supports the use of small group instruction to increase teacher-to-student interactions. The level of academic responding by students did not change from baseline to intervention indicating possibly that a 20-30 minute intervention is not powerful enough to impact a 1 1/2 hour observation.

A second area in which the program allows for analysis is to compare which teacher behaviors match or co-occur with which student behaviors. Table 12 summarizes output data across study groups. In general, the behavior of the teacher did not seem to elicit specific or consistent student responses in any category. This reflects a high degree of variability in how students reponded to different types of teacher behavior. This type of detailed analysis could however be quite useful if specific teacher behaviors are selected for intervention.

A third area of analysis using the CISSAR-SPED data was to isolate a specific period during the observation and determine behavioral interactions occurring for the selected time block. Table 13 presents a summary of student behaviors which occurred during the specific small group instruction period (20-30 minutes of the 1 1/2 hour

Table 11

Experimentals	Instruction to Entire Group		Instruction to Small Group		One-to-One Instruction		Independent Activity	
	Baseline	Intervention	Baseline	Intervention	Baseline	Intervention	Baseline	Intervention
% of intervals	6%	7%	16%	32%	20%	9%	56%	51%
Academic Responding	32%	36%	32%	31%	58%	60%	46%	46%
Task Management Responding	32%	36%	45%	42%	32%	22%	19%	19%
Inappropriate Responding	15%	10%	4%	7%	2%	6%	12%	10%

Controls	Instruction to Entire Group		Instruction to Small Group		One-to-One Instruction		Independent Activity	
	Baseline 1	Baseline 2	Baseline 1	Baseline 2	Baseline 1	Baseline 2	Baseline 1	Baseline 2
% of Intervals	7%	11%	38%	28%	21%	20%	32%	39%
Academic Responding	27%	38%	19%	56%	66%	74%	41%	57%
Task Management Responding	53%	48%	50%	18%	17%	11%	20%	16%
Inappropriate Responding	9%	2%	9%	3%	8%	4%	24%	6%

Table 12

	Experimentals: Baseline						Experimentals: Small Group Intervention						
	MR	GN	T	OT	A	D		MR	GN	T	OT	A	D
% of Intervals	21%	26%	40%	5%	6%	2%	% of Intervals	18%	23%	43%	9%	5%	2%
AR	40%	46%	46%	35%	55%	36%	AR	42%	46%	39%	43%	42%	20%
MR	24%	17%	34%	35%	25%	24%	MR	23%	17%	36%	21%	37%	17%
IR	9%	11%	8%	10%	8%	20%	IR	9%	11%	7%	6%	8%	41%

	Controls: Baseline 1						Controls: Baseline 2						
	MR	GN	T	OT	A	D		MR	GN	T	OT	A	D
% of Intervals	22%	21%	50%	3%	3%	1%	% of Intervals	12%	29%	48%	6%	4%	1%
AR	23%	31%	45%	26%	57%	20%	AR	53%	66%	53%	72%	45%	60%
MR	34%	31%	35%	39%	11%	20%	MR	18%	12%	24%	22%	14%	0%
IR	13%	16%	13%	13%	14%	20%	IR	7%	3%	4%	0%	10%	0%

Teacher Codes

MR = No Response
GN = General Teaching (Non-target student)
T = Teaching Target Student
OT = Other Talk
A = Approval
D = Disapproval

Student Codes

AR = Academic Responding
MR = Task Management Responding
IR = Inappropriate Responding

observation). This selective review allowed us to analyze eco-behavioral variables as they related to the intervention. There was considerable difference in student behaviors across teachers in levels of academic responding, ranging from 16 to 53%. Teacher A and teacher D were the teachers eliciting highest levels of academic responding from students and lowest rates of inappropriate behaviors. Those teachers were identified by the researchers as those conducting their small groups at a fast pace (more trials in less amount of time) and the teachers who reinforced students at higher rates. The CISSAR-SPED data thus confirmed our informal observations and allowed us to quantify (% of academic responding) the functionality of teaching behaviors identified in the group teaching manual as key behaviors to conducting small groups. This type of analysis would also be crucial in providing further teacher training and documentation of the training for student outcomes. The data presented in the table also shows a further feature of the CISSAR-SPED code in that one can identify how often student behaviors co-occur in the academic, task management, and inappropriate responding categories (3-22%) as opposed to academic responding and inappropriate responding (0-7%).

Table 13

Teacher	AR	MR	IR	AR/MR	AR/IR	MR/IR	AR/MR/IR
A	53%	39%	2%	1%	1%	3%	1%
B	16%	42%	10%	4%	5%	20%	0%
C	27%	48%	14%	1%	0%	9%	0%
D	35%	52%	3%	0%	0%	9%	0%
E	22%	25%	24%	1%	6%	22%	1%
F	19%	44%	5%	7%	2%	14%	9%

AR = Academic Responding
MR = Task Management Responding
IR = Inappropriate Responding

A final area for data analysis using the CISSAR-SPED has been to quantify ecobehavioral variables across classrooms as a means of within or between comparisons. Table 14 presents examples of frequency percentages for several of the categories. These data are summarized for 61 of the total 73 observations. From this data we can see types of curriculum areas that teachers are implementing, most common inappropriate behaviors students are exhibiting, instructional arrangements being used, and teacher behaviors. This type of data would be most useful for planning and evaluating teacher training, student academic and behavioral needs, and inservice needs.

In summary, the development of the CISSAR-SPED code and accompanying computer analysis program has furthered the documentation of research activities for the current project and will provide a valuable tool for future research efforts.

Table 14

Classroom	Student Competing Behaviors								
	DI	PI	IT	TNA	IL	LA	SST	SA	NI
A	2	3	1	2	4	13	2	0	72
B	1	1	1	1	5	13	7	0	70
C	0	1	2	4	2	9	2	0	79
D	1	0	1	5	1	16	18	0	58
E	0	0	0	1	3	17	3	0	75
F	0	0	0	1	0	10	5	0	83

DI = Disrupt
PI = Play Inappropriate
IT = Inappropriate Task
TNA = Talk Non-Academic
IL = Inappropriate Location
LA = Look Around
SST = Self-Stimulation
SA = Self Abuse
NI = None

Classroom	Instructional Arrangement					Teacher Behavior					
	EG	SG	1:1	IA	NA	I	GN	OT	A	D	NR
A	10	45	19	20	3	33	53	4	3	1	10
B	29	32	18	17	2	48	31	4	5	1	9
C	7	18	18	55	0	25	33	17	8	2	11
D	1	18	8	68	4	17	32	7	4	1	34
E	1	11	20	68	0	25	46	6	6	3	9
F	2	16	12	70	0	14	34	8	2	1	31

EG = Entire Group
SM = Small Group
IN = Individual
1:1 = One to one
IA = Independent Activity
NA = No Assigned Activity
T = Teaching
GN = General Teaching
OT = Other Talk
A = Approval
D = Disapproval

(Table 14 continued)

Curriculum Activity

Classroom	R	M	S	H	L	SC	SS	PV	MS	DL	SF	AC	FT	BM	TN	CT
A	3	25	2	15	19	0	0	1	8	1	0	12	2	0	9	0
B	2	3	1	1	44	0	0	12	2	3	2	17	5	0	8	0
C	5	36	1	13	22	0	0	4	0	0	2	9	1	0	6	0
D	2	1	0	0	8	0	0	59	0	11	0	0	7	0	11	0
E	0	2	2	14	18	0	0	18	29	0	0	6	3	0	10	0
F	11	6	8	25	20	0	0	14	0	0	0	3	0	0	12	0

R = Reading
M = Mathematics
S = Spelling
H = Handwriting
L = Language
SC = Science
SS = Social Studies
PV = Pre Vocational/Vocational
MS = Motor Skills
DL = Daily Living Skills
SF = Self-Care Skills
AC = Arts/Crafts
FT = Free Time
BM = Business Management
TN = Transition
CT = Can't Tell

CONCLUSIONS

The overall objective of the research project was to experimentally validate the use of tutoring and small group formats as alternative instructional strategies to exclusive use of one-to-one teaching. Through use of single-subject studies and experimental-control group designs described in the previous sections, tutoring and small group instruction have been clearly demonstrated as viable procedures for students with autism and developmental disabilities. Investigations and data analyses support the following research conclusions:

1. Nonhandicapped students can effectively increase academic skills (i.e., language, math, reading) for children with autism through use of peer tutoring formats.
2. Nonhandicapped students can effectively manage attending behaviors of their autistic peers in tutoring formats.
3. Academic performance for students receiving peer tutoring generalizes to adults during acquisition probe sessions.
4. Higher functioning autistic students can be trained as effective tutors for their lower functioning peers.
5. Autistic students show appropriate levels of skill acquisition following tutoring from the higher functioning peers.
6. Small group instructional formats are superior to one-to-one instruction in terms of student acquisition as measured by criterion-referenced tests.
7. Small group instruction is a viable procedure across several curriculum areas: language, math, vocational, compliance, and shopping skills.

8. Small group instruction produces higher levels of correct responding and reinforcement rates during sessions than does one-to-one instruction.
9. Small group instruction produces higher levels of teacher-to-student interactions and student-to-student interactions than does one-to-one instruction.
10. Small group instructional formats maintain appropriate levels of student on task behavior; rates comparable to one-to-one formats.
11. Student self-stimulatory behavior remains at comparable levels during one-to-one and small group instruction.
12. Tutoring and small group teaching procedures can be effectively disseminated through the use of written teacher manuals.

In conclusion, the research has supported the use of tutoring and small group instructional formats for students with autism and developmental disabilities. These investigations have supported the use of these alternative procedures and demonstrated the many benefits. Peer tutoring and group formats more closely approximate "normal" educational and community settings, thus indicating potentially better preparation for mainstreaming to regular classrooms or transitioning to work environments. Tutoring and small group formats maximize classroom learning time. It is more efficient to teach 3 to 5 students in a group or to have individual tutors for each student than for teachers to rotate one-to-one instruction. Group arrangements increase the opportunities for teachers to interact with more students at a time, and provides an easier vehicle for monitoring student progress in comparison to others in the class. In addition, group formats increase the rate of teacher-to-student interactions, and reduce the levels of non-

instructional time for the class as a whole. Furthermore, both tutoring and group instruction increase student-to-student interactions and the potential benefits thereof, (i.e., modeling, incidental learning, and appropriate social interactions) for handicapped and nonhandicapped students.

DISSEMINATION

Dissemination of project findings have extended over the 3-year period and efforts are continuing beyond the termination data. These activities include: (a) presentations at state and national conferences; (b) completion of graduate student theses/dissertations; (c) published or submitted journal articles and teacher training manuals; and (d) informal dissemination of materials and information to other educational settings as requests are made. The following lists provide information regarding project dissemination activities to date.

Conference Presentations

Whorton, D. M., Thibadeau, S. F., McGrale, J. E., Walker, D., Rotholz, D., & Sasso, G. M. (1986, May). The use of peers and group teaching practices as alternative educational strategies with autistic and developmentally disabled youth. Symposium presented at the 12th Annual Conference of the Association for Applied Behavior Analysis, Milwaukee, Wisconsin.

Greenwood, C. R., Walker, H. M., Carta, J. J., Nelson, C. R., Otis-Wilborn, A., Rotholz, D., & Whorton, D. M. (1986, May). Applied uses of ecobehavioral data: Program evaluation, teacher training, and research in regular and special education settings. Symposium presented at the 12th Annual Conference of the Association for Applied Behavior Analysis, Milwaukee, Wisconsin.

Rotholz, D. A. (1986, April). Application of ecobehavioral analysis to the education of autistic students: A case study. Symposium presented at the 2nd Annual Conference of the Efficacy Research Institute, Newton, Massachusetts.

Whorton, D. M., Rotholz, D. A., & Walker, D. (1985, December). Academic programs with children with autism: A comparison of one-to-one instruction and group teaching methods. Workshop presented at the 12th Annual Conference of The Association for Persons with Severe Handicaps, Boston, Massachusetts.

Whorton, D. M., Walker, D., & Locke, P. (1985, July). Academic programs with autistic children: A comparison of tutors, one-to-one instruction, and group teaching methods. Presented at the 17th Annual meeting and conference of the National Society for Children and Adults with Autism, Los Angeles, California.

Rotholz, D. A., & Walker, D. (1985, May). Research with autistic students in a public school setting. Symposium presented at the 11th Annual Conference of the Association for Applied Behavior Analysis, Columbus, Ohio.

Whorton, D. M. (1985, April). Classroom procedures for autistic children. Presentation to the Johnson-Wyandotte County Chapter of the Kansas Society for Children and Adults with Autism, Shawnee Mission, Kansas.

Locke, P., Whorton, D. M., Walker, D., & McGrale, J. (1985, March). Academic programs with autistic children: A comparison of tutors, one-to-one, and group teaching methods. Workshop presented at the annual spring conference of the Council for Exceptional Children: Missouri Federation, Lake of the Ozarks, Missouri.

Locke, P., & Whorton, D. M. (1984, July). Autistic children in the public schools: A multiple approach. Informal presentations at the 16th Annual Conference of the National Society for Children and Adults with Autism, San Antonio, Texas.

Whorton, D. M., Walker, D., Rotholz, D. A., & Norris, M. (1984, May). Classroom instructional programs with autistic children: Group structures and tutorial models. Poster session presented at the 10th Annual Conference of the Association for Applied Behavior Analysis, Nashville, Tennessee.

Publications

Delquadri, J., Elliott, M., Whorton, D., Sasso, G., Hughes, V., & Greenwood, C. R. (in preparation). Tutoring packages: I. Field utilization results. Kansas City, KS: Juniper Gardens Children's Project, Bureau of Child Research, University of Kansas.

Delquadri, J., Elliott, M., Whorton, D., Sasso, G., Hughes, V., & Greenwood, C. R. (in preparation). Peer and parent mediated instructional packages for reading: II. Field utilization research. Kansas City, KS: Juniper Gardens Children's Project, Bureau of Child Research, University of Kansas.

Delquadri, J., Greenwood, C. R., Whorton, D., Carta, J., & Hall, R. V. (1986). Classwide peer tutoring. Exceptional Children, 6, 535-542.

Greenwood, C. R., Dinwiddie, G., Bailey, V., Carta, J. J., Dorsey, D., Kohler, F., Nelson, C., Rotholz, D., & Schulte, D. (submitted). Longitudinal effects of classwide peer tutoring on spelling achievement. Journal of Applied Behavior Analysis.

Greenwood, C. R., Whorton, D., & Delquadri, J. (1984). Tutoring methods of instruction: Increasing students' opportunity to respond and achievement. Direct Instruction News, 3, 4-7.

Norris, M. B. (1984). Teacher implementation of a group instructional procedure with autistic youth: Training language and social interactions within a leisure skill activity. Master's Thesis, Department of Human

Development and Family Life.

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Appendix A

Sample Criterion-Referenced Skills Tests

Money Tasks

1. Teacher points to coins, one at a time, and asks student to name the coin. Penny, nickel, dime, quarter.
2. Teacher points to coins, one at a time, and asks students "How much is this worth?".
3. Student matches number to correct coin--5:nickel, 1:penny, 10:dime, 25:quarter.
4. Coins are on table, teacher asks student to give her penny/nickel/dime/quarter.
5. Worksheet with coin stamps down one side and number value on other side is given to student to match.
6. Worksheet with coin stamps down one side and number word on other side is given to student to match.
7. Pictures from magazines of food items are put on flashcards with prices 1¢, 5¢, 10¢, 25¢. Student matches correct coins to pictures.
8. Student has two sets of flashcards, one set has coin stamp, one set has number value. Student matches card.
9. Teacher lines up coins (2 of each) one of each coin is face up, one is face down--student matches.
10. Teacher places 2-10 pennies in a group and asks student "How much is this worth?".
11. Teacher places nickel plus 1-5 pennies in group and asks student "How much is this worth?".
12. Teacher places dime plus 1-5 pennies in group and asks student "How much is this worth?".
13. Teacher places quarter plus 1-5 pennies in group and asks student "How much is this worth?".
14. Flashcards are made with the above coin combination. Student matches to corresponding number cards.
15. Worksheet with coin combinations (money stamps) down one side and number values down other side are given to students to match.
16. Pictures with price 4, 5, 12, 14, 26, and 29¢ etc., are given to student. He matches with coin combination cards or counts out money.
17. Teacher has change on table. Ask student to give you 2¢, 3¢, 5¢, 6¢...28¢, 29¢,

Pre-Post Test

Stimulus Questions

1. Who is in the picture
2. What are they (he/she) doing
3. Where are they
4. When do you eat
5. How do you get to school
6. Why do you go to the store
7. Who is your teacher
8. What is in the picture
9. Where do you play
10. When do you sleep
11. How do you make a sandwich
12. Why do you laugh
13. What do you do at Crown Center
14. Where do you go after school
15. How does the boy/girl feel
16. Why do you go to Burger King
17. When do you have a party
18. Who is this
19. What is happening in the book
20. When is your birthday
21. Who do you live with
22. How do you build a house
23. Where are the animals
24. Why do you go to the zoo
25. What do you do at Christmas
26. Where do boats go
27. When do you brush your teeth
28. How do you make a picture
29. Why do you wear a coat
30. Who likes candy

Pre-Post Test

PreAcademic Skills

1. Shake the bell
2. Stand up and touch your head
3. Open the book
4. Shake the can
5. Put the bean bag under the chair
6. Hold up number 1
7. Put the circle in the box
8. Hold up the color blue
9. Clap your hands
10. Shake your head
11. Put the comb in the box
12. Put the keys in the purse
13. Put the hat on
14. Open the box
15. Stand up and push in your chair
16. Where is the ball in the picture
17. Where is the boy in the picture
18. Where is the girl in the picture
19. Where is the dog in the picture
20. Find the shoe in the picture
21. Find the pants in the picture
22. Find the shirt in the picture
23. Hand me the comb
24. Hand me the shoe
25. Hand me the sock
26. Hand me the hat
27. Hand me the cup
28. Hand me the plate
29. Stand up and touch your head
30. Hold up number 3

Appendix B

Teacher Observation Form (definitions, form)

TEACHER OBSERVATION FORM DEFINITIONS (PERFORMANCE DATA)

1. Trial Presentation

   a. Frequency: number of trials *presented to

      1. individual students in group
      2. collective group of students

   b. Child response: score as correct ("+") or incorrect ("-")

*The onset of a trial is defined as a clear instruction given to student(s), student(s) should be attending to the teacher and/or the materials being used. A trial ends when the desired student response is obtained.

2. Teacher Prompts & Feedback - the number of prompts or assistance given to student(s) following incorrect response, or no response. All assistance or cues given to the student(s) following the initial instruction are scored as prompts for that trial, with the exception of models (see below). "Feedback" the number of comments of statements directed toward student(s) academic response(s) that are not prompts, models, or reinforcers. Examples include, "No, that's not right"., or "You can learn this". This category does not include behavioral feedback or non-instructional comments (e.g., "You need to be in your seat.").

3. Teacher Modeled Responses - the number of correct responses modeled before student following an incorrect response, or no response. For example, upon presentation of a word card, "Joe, this is Exit. What's the word?".

4. Reinforcement - the number of praise statements, tokens, stickers, food, physical strokes, or smiles given/directed toward student(s) following correct or desired behavior. The teacher repeating the correct answer following student(s) response, is also scored as a reinforcer.

5. Behavior Management - the number of interactions from teacher to student designed to elicit appropriate behavior, or terminate inappropriate behavior.

TRIAL OBSERVATION SHEET

Date: _____ Student Name: _____

Class: _____

Task: _____

Format		Model	Prompt	Rein	Beh. Mang.
I	C				
	C				
	C				

Appendix C

Teacher Checklist

Group Teaching Checklist

Following a group teaching session, review the questions below. Circle the applicable number in response to each question. Page numbers refer to manual.

Scale

1 - Teacher needs additional training before conducting another group session.

2 - Teacher needs to refer to manual before conducting another group session.

3 - Teacher should review manual but continue with sessions.

4 - Teacher's performance satisfactory and should continue as is.

1.	Does teacher us good discrete trial teaching methodology when completing				
	a. individual trials? (pp. 11-12)	1	2	3	4
	b. collective trials? (pp. 11-12)	1	2	3	4
2.	Does teacher ensure the group is attending prior to beginning the group? (pp. 11-12, 21-22)	1	2	3	4
3.	Are materials and reinforcers within easy reach? (p 28.)	1	2	3	4
4.	Is optional seating arrangement utilized in relation to				
	a. students' levels of functioning? (pp. 25-27)	1	2	3	4
	b. students' behaviors? (pp. 25-27)	1	2	3	4
5.	Does teacher intersperse known and unknown tasks during the session? (p. 12-13)	1	2	3	4
6.	Does teacher alternate the order and sequence of task presentation? (p. 12-14)	1	2	3	4
7.	According to the group composition does teacher distribute instructions of a similar rate with all students? (pp. 11-13)	1	2	3	4
8.	Does teacher keep the flow of the group moving fast enough to keep students' interest high? (p. 4 & 12)	1	2	3	4
9.	Is the length of the session appropriate? (p. 22)	1	2	3	4

10.	Does teacher reinforce students' appropriate behaviors? (p. 24)	1	2	3	4
11.	Does teacher distribute reinforcers equally among students? (p. 21)	1	2	3	4
12.	Does teacher deal with behavior problems efficiently (i.e., is it obvious that s/he has planned ahead)? (p. 20-21)	1	2	3	4
13.	Does teacher frequently scan the entire group? (p. 24)	1	2	3	4
14.	Does teacher provide ample opportunities for observational and incidental learning to occur? (p. 14)	1	2	3	4
15.	Does teacher require all students' to observe one another? (p. 14)	1	2	3	4
16.	Does teacher use consistent and clear correction procedures? (pp. 14-19)	1	2	3	4
17.	(Overall rating) Does teacher conduct the session efficiently?	1	2	3	4

Comments:

Appendix D

Teacher/Consultant Satisfaction Surveys

TEACHER SATISFACTION SURVEY RESULTS

Questions	Mean Responses	Ranges
1. The students who participated in the group teaching situation benefited academically.	1.3	1 - 2
2. Students who participated in the group teaching situation behaved appropriately.	2.6	1 - 3
3. Preparation time for the group teaching format was similar to preparation time for 1:1 sessions.	2.3	1 - 4
4. Academic benefits were similar in the group teaching and 1:1 sessions.	2.5	1 - 3
5. Levels of maladaptive student behavior were similar in both 1:1 and group teaching sessions.	2.8	1 - 5
6. I would use a group teaching format again with my students.	1.2	1 - 2
7. I feel that training provided to me by my consultant adequately prepared me to conduct my group.	1.8	1 - 3
8. The group teaching manual was very helpful in preparation for my group.	2.0	1 - 3
9. The group teaching video tape was valuable in preparation for my group.	2.7	1 - 4
10. The group teaching checklist was a good "tool" for self-monitoring my group.	3.0	1 - 5
11. The group teaching checklist was a good way for the consultant to provide me with feedback on my group teaching.	3.0	1 - 5

KEY: 1 = Strongly Agree
2 = Agree
3 = Neutral
4 = Disagree
5 = Strongly Disagree

CONSULTANT SATISFACTION SURVEY RESULTS

Questions	Mean Responses	Ranges
1. The students who participated in the group teaching situation benefited academically.	1.0	-----
2. Students who participated in the group teaching situation behaved appropriately.	1.3	1 - 2
3. I would recommend use of a group teaching format in the future.	1.0	-----
4. The workshops provided to me by Juniper Gardens Staff adequately prepared me for my role role as a consultant.	1.3	1 - 2
5. The group teaching manual used in the workshops was very helpful in preparing me for my role as a group teaching consultant.	1.3	1 - 2
6. The group teaching videotape used in the workshops was very helpful in preparing me for my role as a group teaching consultant.	1.5	1 - 3
7. The four page consultant checklist was very useful in specifying my responsibilities as a consultant.	1.5	1 - 2
8. The group teaching manual was very helpful in the workshops I provided for my teacher.	1.3	1 - 2
9. The group teaching videotape was very helpful in workshops I provided for my teacher.	1.3	1 - 2
10. The group teaching checklist was very helpful for me in providing feedback and monitoring the group.	2.3	1 - 4
11. Having the corresponding group teaching manual page numbers in each group teaching checklist question was useful.	1.5	1 - 2
12. The consultant model is a viable method for sharing procedures.	2.3	1 - 4
13. I would provide consultation of this type again.	2.3	1 - 4

KEY: 1 = Strongly Agree; 2 = Agree; 3 = Neutral; 4 = Disagree; 5 = Strongly Disagree

Appendix E

CISSAR-SPED Instrument: Categories

Appendix
Special Education CISSAR Categories

Instructional Context Categories

Activities

(Academic)

1. Reading
2. Mathematics
3. Spelling
4. Handwriting
5. Language
6. Science
7. Social Studies
8. Pre Vocational/Vocational
9. Motor Skills
10. Daily Living and Community Skills
11. Self-Care Skills

(Non-Academic)

12. Arts/Crafts
13. Freetime
14. Class Business Management
15. Transition
16. Can't Tell

Tasks

1. Readers
2. Workbook
3. Worksheet
4. Paper/Pencil
5. Listen/Lecture
6. Other Media
7. Teacher-Student Discussion
8. Fetch/Put Away
9. Time Out

Structures Physical

1. Entire Group
2. Small Group
3. Individual

Teacher Position

1. In Front
2. At Desk
3. Side
4. Back
5. Out of Room

Instructional

1. Instruction to Entire Group
2. Instruction to Small Group
3. One to One
4. Independent Activity
5. No Assigned Activity

Teacher Behavior

1. No Response
2. Teaching
3. General Teaching
4. Other Talk
5. Approval
6. Disapproval

Student Behaviors Categories

Academic Responding

1. Writing
2. Academic Game Play
3. Reading Aloud
4. Reading Silent
5. Talking Appropriately
6. Answers Academic Question
7. Asks Academic Question
8. Task Participation
9. None

Task Management

10. Waiting Appropriately
11. Raising Hand/Signaling for help
12. Looking for materials
13. Moves to New Station
14. Playing Appropriately
15. None

Competing Behaviors

16. Disrupt
17. Play Inappropriate
18. Inappropriate Task
19. Inappropriate Locale
20. Look Around
21. Self Stimulation
22. Self Abuse
23. None

__:__
Start R M S H L Sc Ss Ac Ft Rr Wb Ws Pp Ll Eg Sg I Ie Is 1:1 Ia Nn
Ba Tn Ct Pv Ms Dl Sf Oa Tsd Fp To N

1 If AD O S B NR Gn T OT A D __:__ _____
1 2 3 4 5 If AD O S B NR T OT A D Stop Stop Code

W G RA RS TA ANQ ASK TP NS WA RH LM M PA NT DI PI IT TNA IL LA SST SA NI

__:__
Start R M S H L Sc Ss Ac Ft Rr Wb Ws Pp Ll Eg Sg I Ie Is 1:1 Ia Nn
Ba Tn Ct Pv Ms Dl Sf Oa Tsd Fp To N

1 If AD O S B NR Gn T OT A D __:__ _____
1 2 3 4 5 If AD O S B NR T OT A D Stop Stop Code

W G RA RS TA ANQ ASK TP NS WA RH LM M PA NT DI PI IT TNA IL LA SST SA NI

__:__
Start R M S H L Sc Ss Ac Ft Rr Wb Ws Pp Ll Eg Sg I Ie Is 1:1 Ia Nn
Ba Tn Ct Pv Ms Dl Sf Oa Tsd Fp To N

1 If AD O S B NR Gn T OT A D __:__ _____
1 2 3 4 5 If AD O S B NR T OT A D Stop Stop Code

W G RA RS TA ANQ ASK TP NS WA RH LM M PA NT DI PI IT TNA IL LA SST SA NI

__:__
Start R M S H L Sc Ss Ac Ft Rr Wb Ws Pp Ll Eg Sg I Ie Is 1:1 Ia Nn
Ba Tn Ct Pv Ms Dl Sf Oa Tsd Fp To N

1 If AD O S B NR Gn T OT A D __:__ _____
1 2 3 4 5 If AD O S B NR T OT A D Stop Stop Code

W G RA RS TA ANQ ASK TP NS WA RH LM M PA NT DI PI IT TNA IL LA SST SA NI

__:__
Start R M S H L Sc Ss Ac Ft Rr Wb Ws Pp Ll Eg Sg I Ie Is 1:1 Ia Nn
Ba Tn Ct Pv Ms Dl Sf Oa Tsd Fp To N

1 If AD O S B NR Gn T OT A D __:__ _____
1 2 3 4 5 If AD O S B NR T OT A D Stop Stop Code

W G RA RS TA ANQ ASK TP NS WA RH LM M PA NT DI PI IT TNA IL LA SST SA NI

__:__
Start R M S H L Sc Ss Ac Ft Rr Wb Ws Pp Ll Eg Sg I Ie Is 1:1 Ia Nn
Ba Tn Ct Pv Ms Dl Sf Oa Tsd Fp To N

1 If AD O S B NR Gn T OT A D __:__ _____
1 2 3 4 5 If AD O S B NR T OT A D Stop Stop Code

W G RA RS TA ANQ ASK TP NS WA RH LM M PA NT DI PI IT TNA IL LA SST SA NI

Appendix F

Study 1: Student Graphs

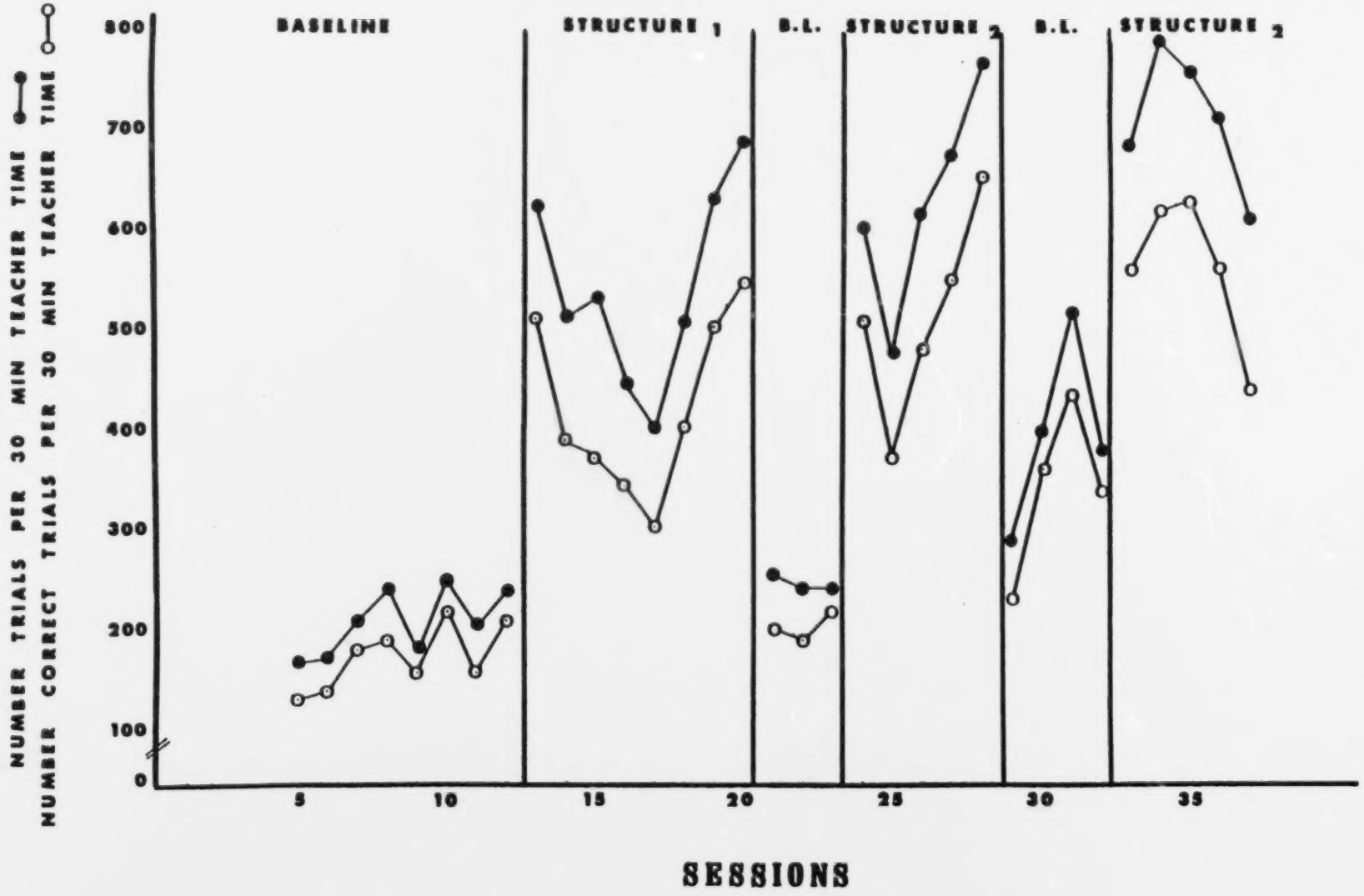

NUMBER TRIALS PER 30 MIN TEACHER TIME
NUMBER CORRECT TRIALS PER 30 MIN TEACHER TIME
800
700
600
500
400
300
200
100
0
BASELINE
STRUCTURE 1
B.L.
STRUCTURE 2
B.L.
STRUCTURE 2
5
10
15
20
25
30
35
SESSIONS

Figure 3

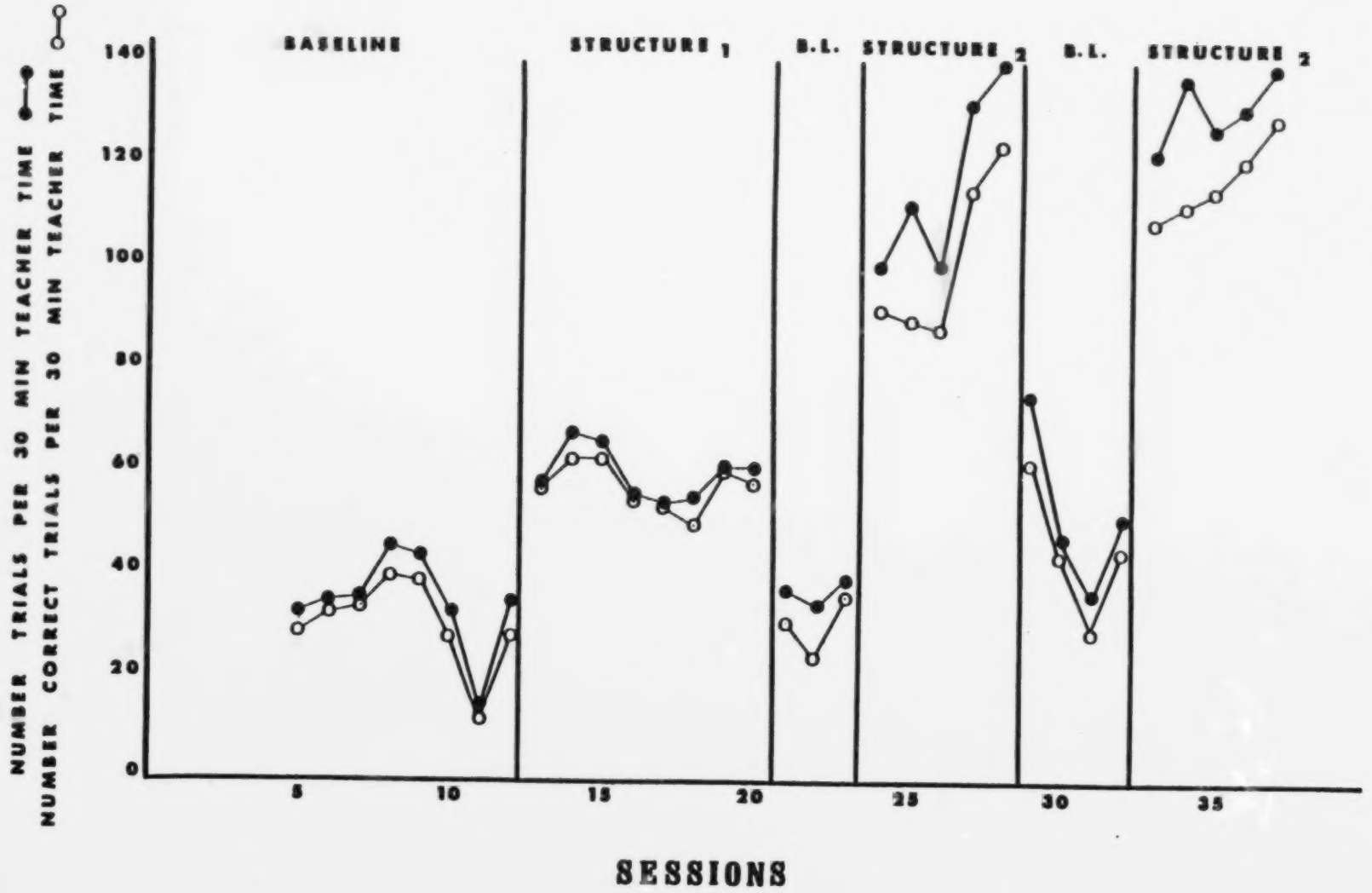

NUMBER TRIALS PER 30 MIN TEACHER TIME
NUMBER CORRECT TRIALS PER 30 MIN TEACHER TIME
BASELINE
STRUCTURE 1
B.L.
STRUCTURE 2
B.L.
STRUCTURE 2
140
120
100
80
60
40
20
0
5
10
15
20
25
30
35
SESSIONS

Figure 4

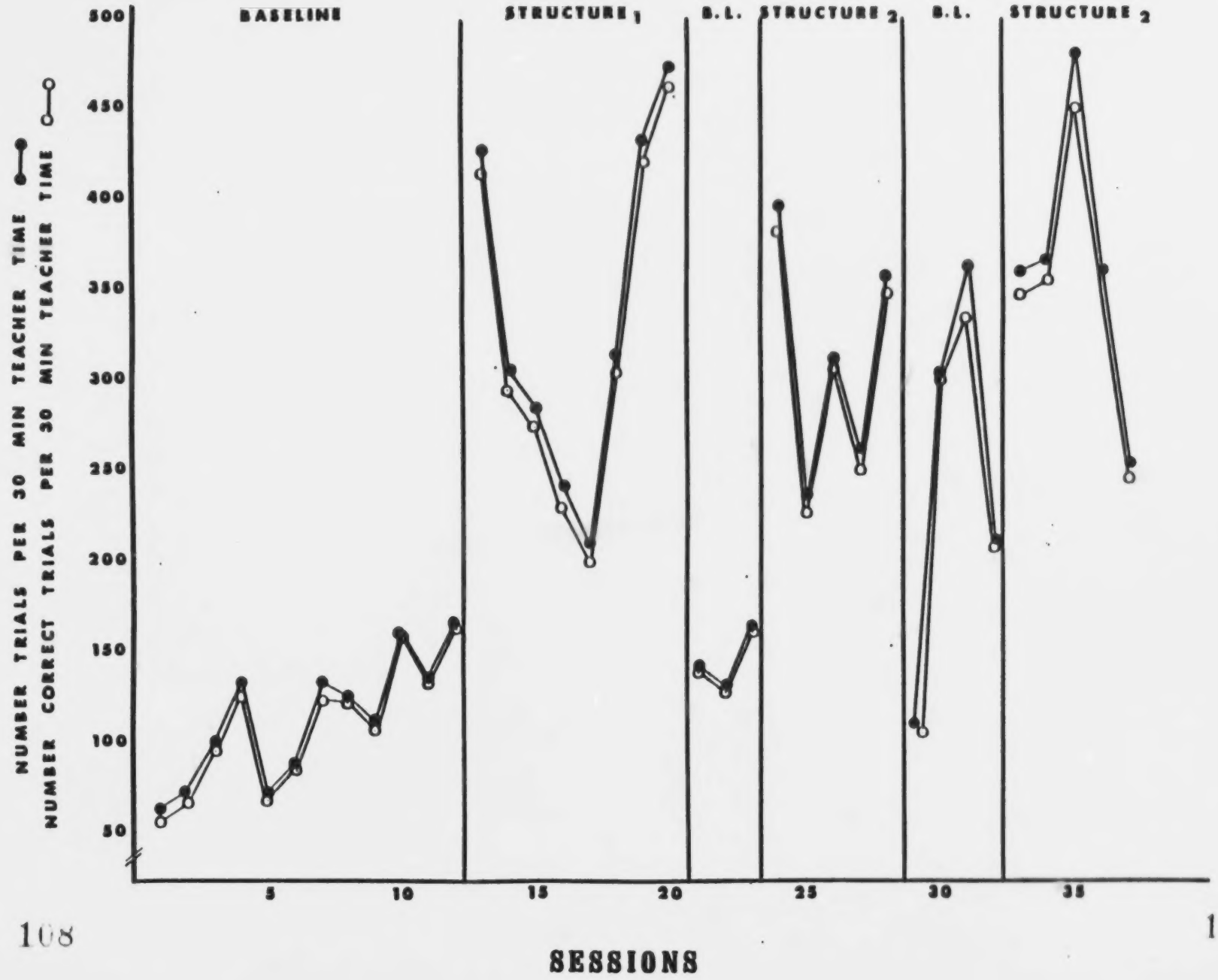

BASELINE
STRUCTURE 1
B.L.
STRUCTURE 2
B.L.
STRUCTURE 2
NUMBER TRIALS PER 30 MIN TEACHER TIME
NUMBER CORRECT TRIALS PER 30 MIN TEACHER TIME
500
450
400
350
300
250
200
150
100
50
5
10
15
20
25
30
35
SESSIONS

Figure 5

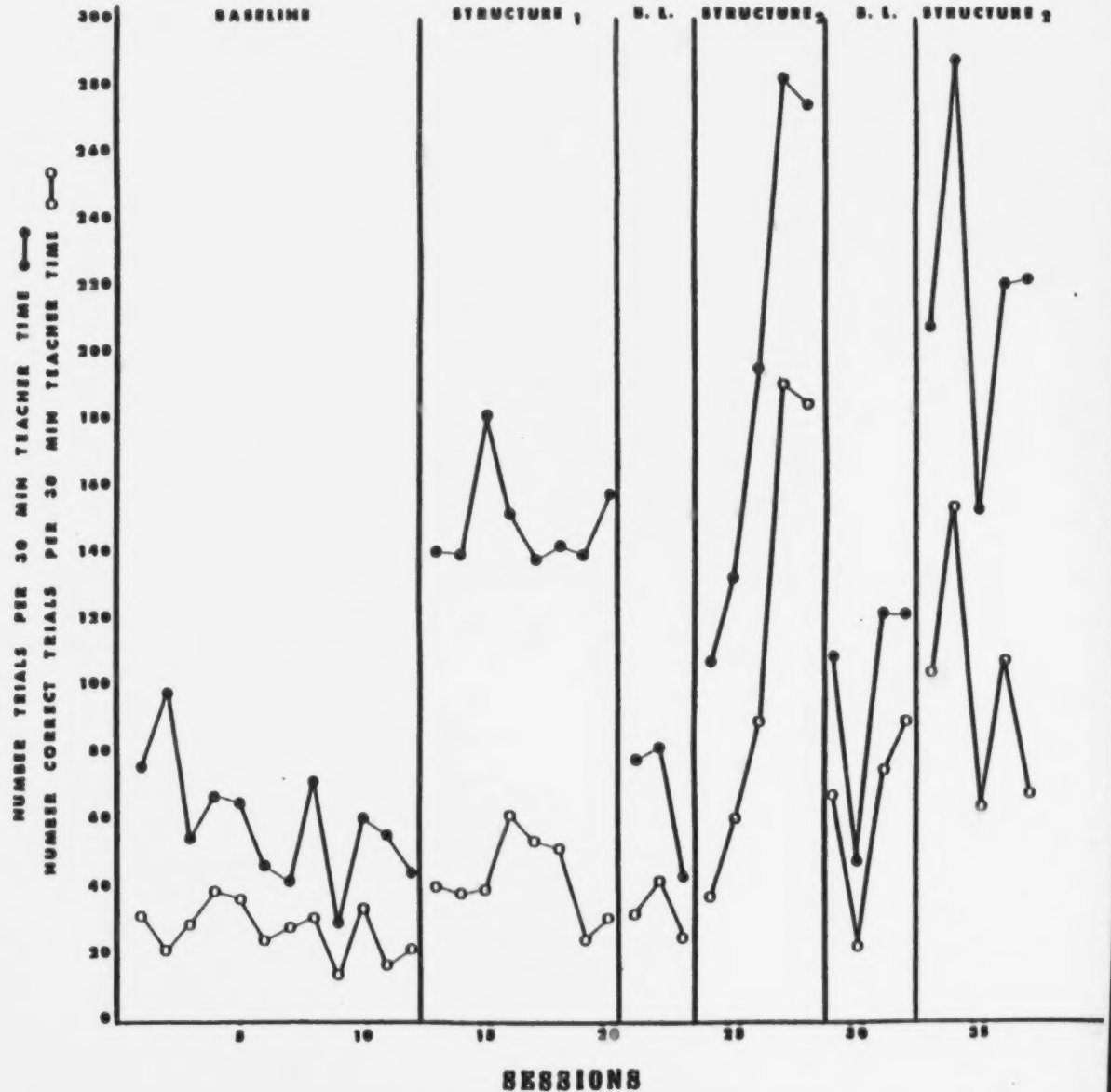

BASELINE
STRUCTURE 1
B. L.
STRUCTURE 2
B. L.
STRUCTURE 2
NUMBER TRIALS PER 30 MIN TEACHER TIME
NUMBER CORRECT TRIALS PER 30 MIN TEACHER TIME
SESSIONS

Figure 6

Appendix G

Study 2: Student Graphs

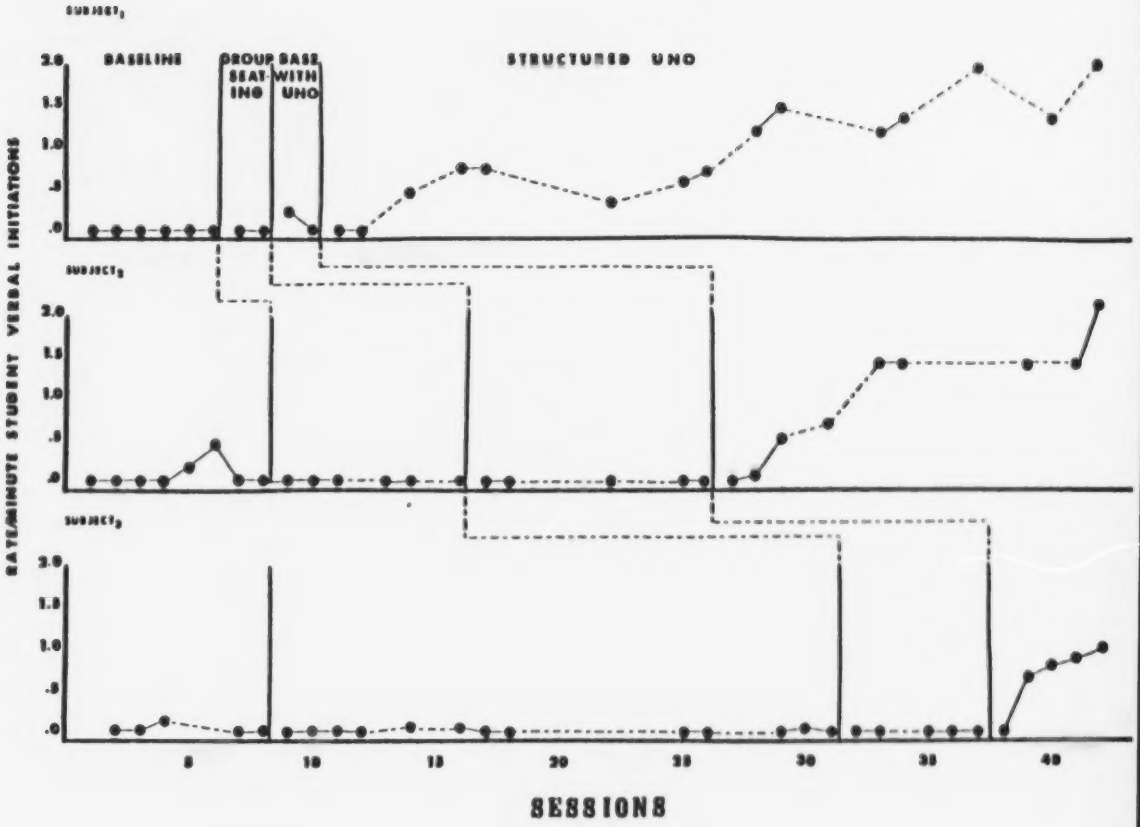


Figure 1. Rate of student verbal initiations per min across experimental conditions. Data were recorded from an 8 min audio tape of the observation sessions.

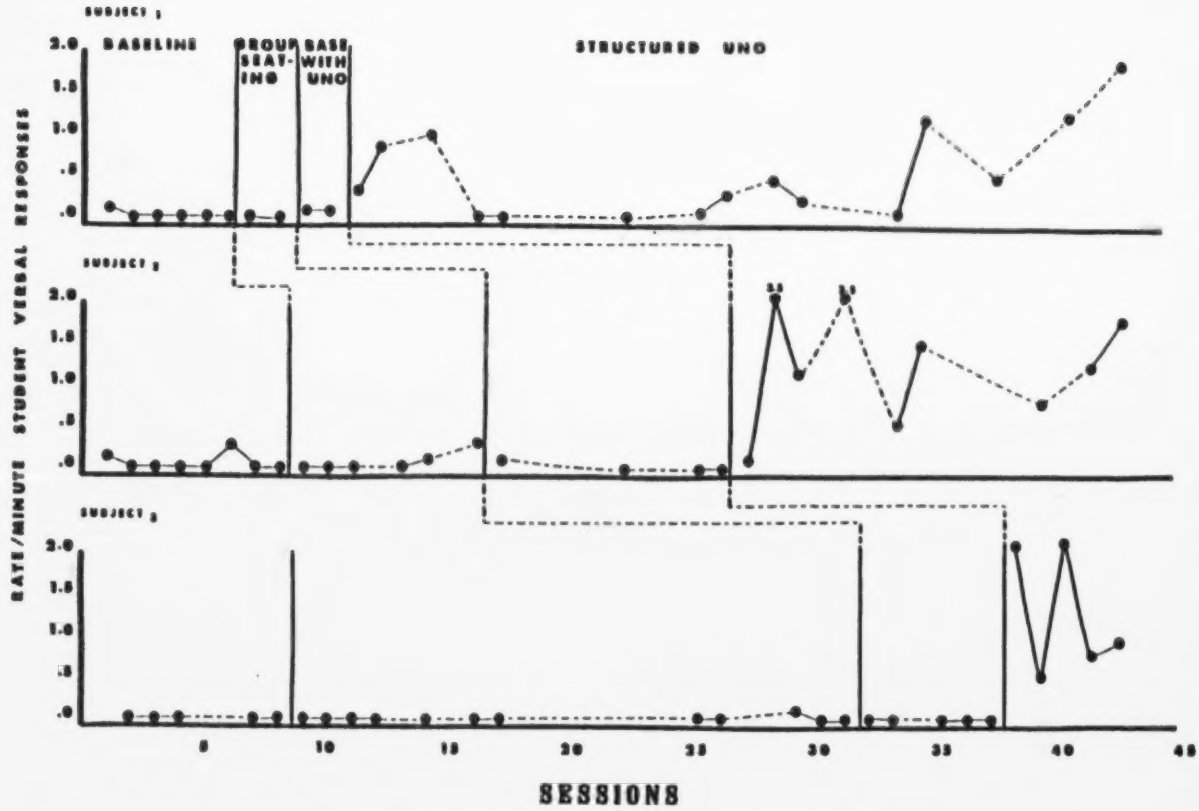


Figure 2. Rate of student verbal responses per min across experimental conditions. Data were recorded from an 8 minute audio tape of the observation sessions.

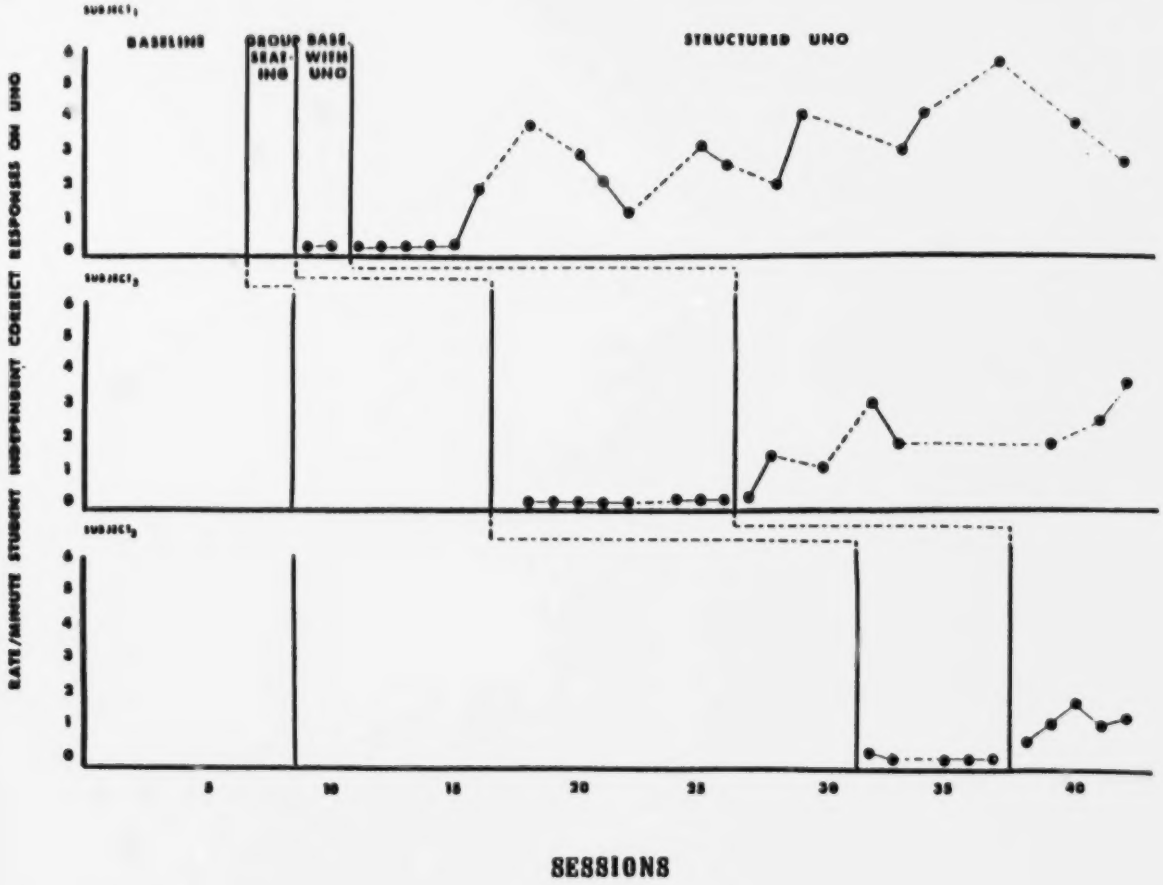
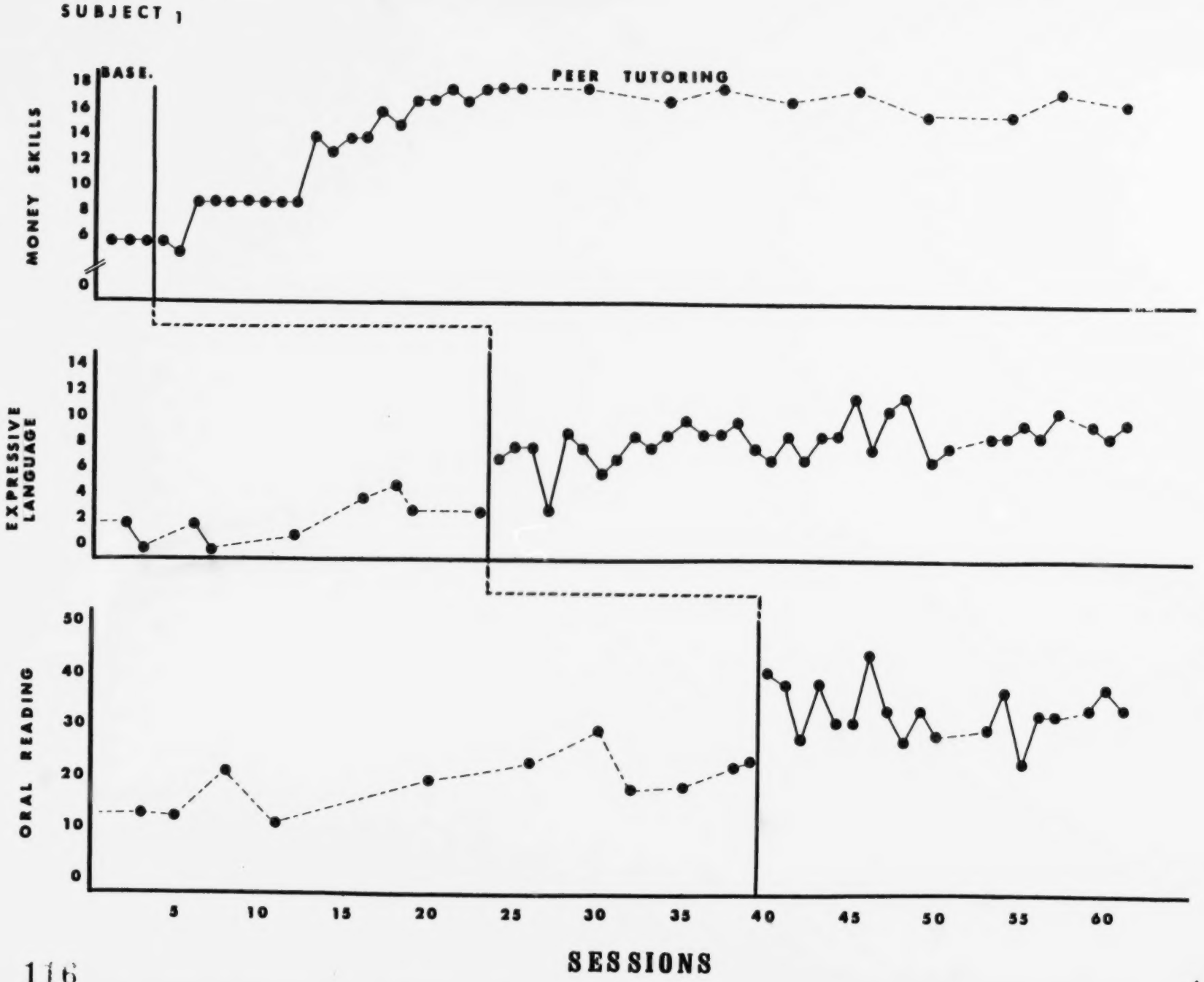
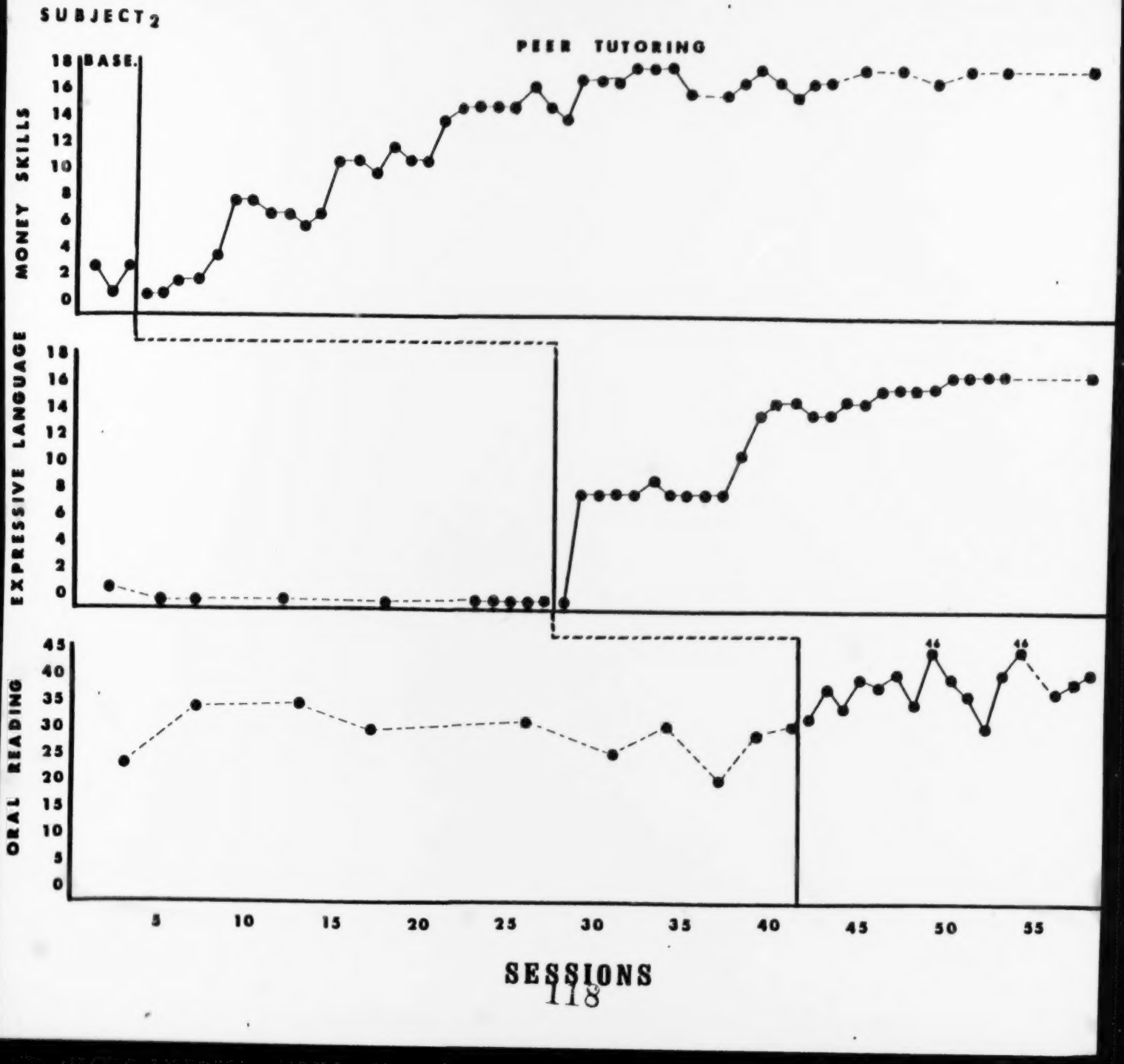


Figure 5. Rate of student correct responses per min for the task analyzed Uno card game. Observation sessions were the first 8 min of the card game.

Appendix H

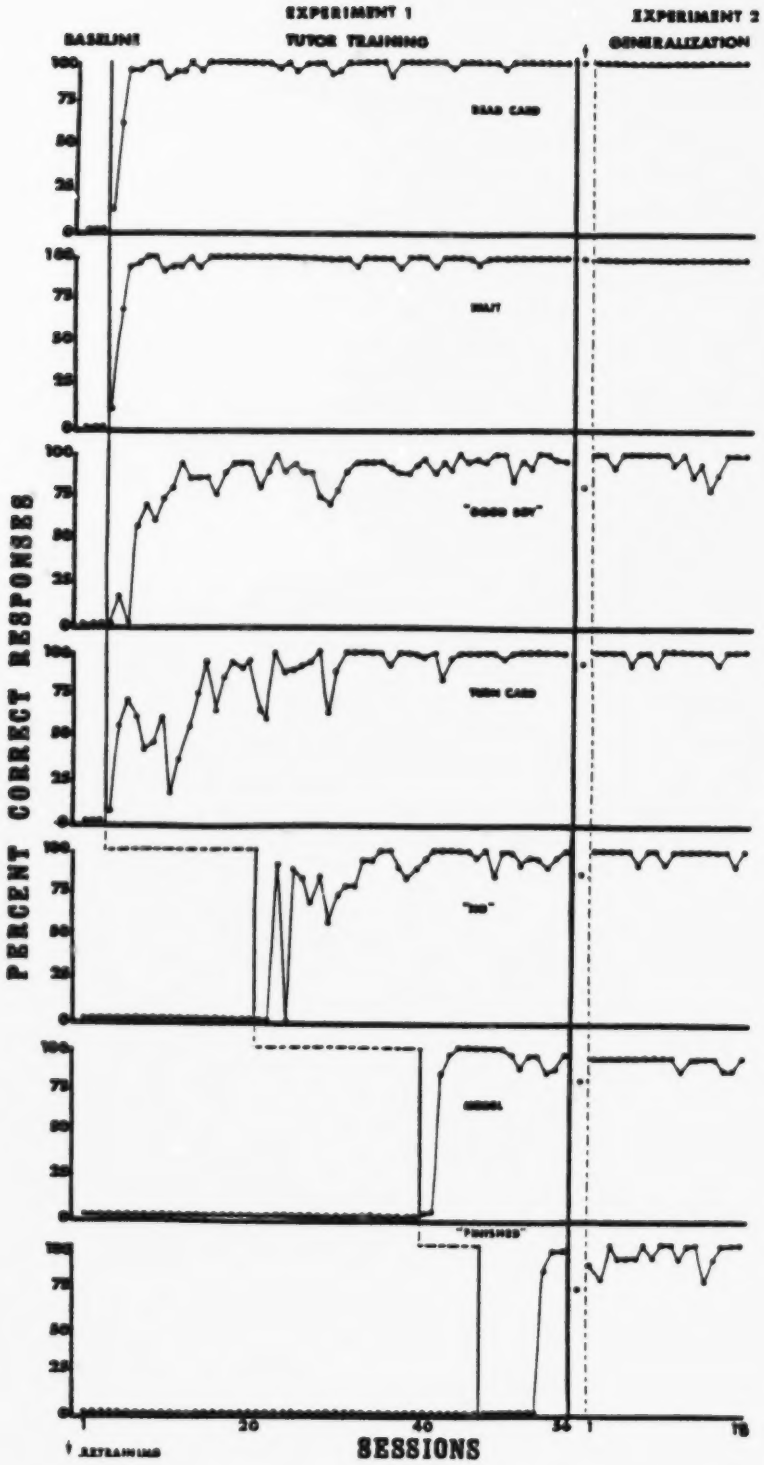
Study 3: Student Graphs

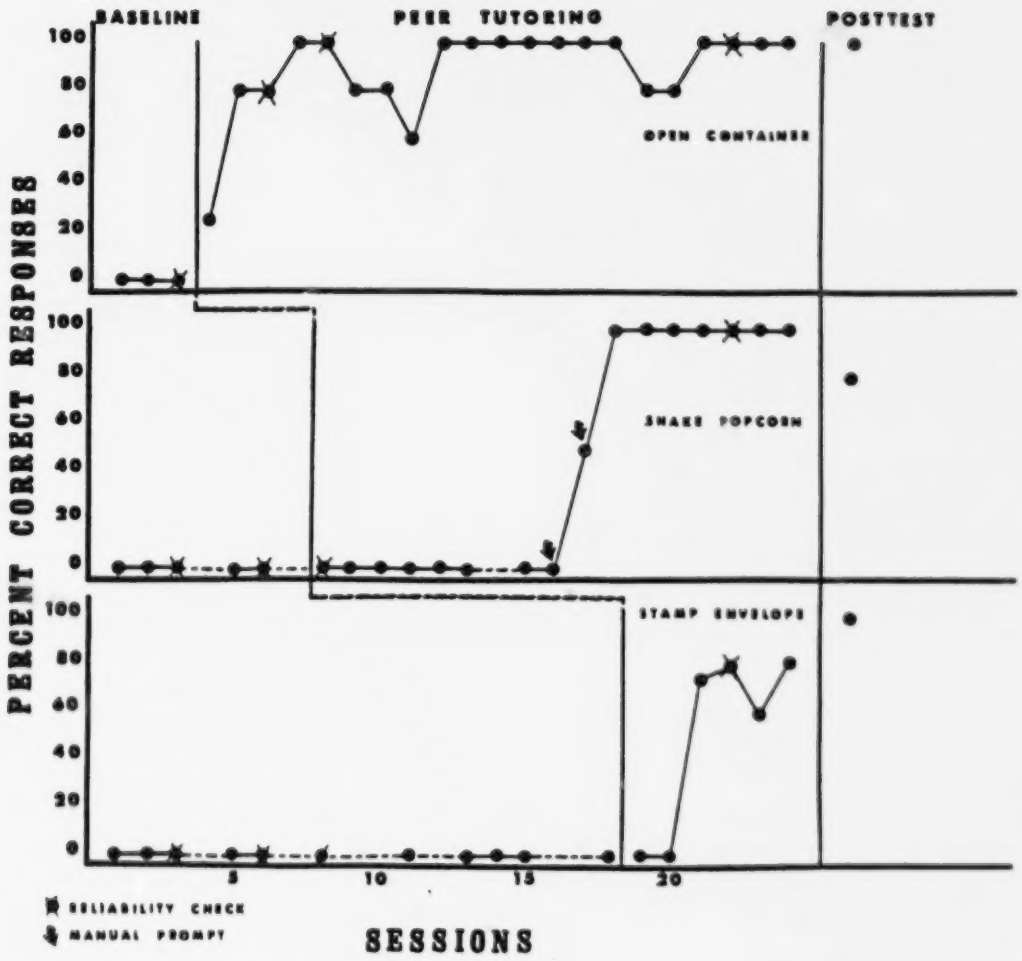

SUBJECT 1
BASE.
PEER TUTORING
MONEY SKILLS
18
16
14
12
10
8
6
0
EXPRESSIVE LANGUAGE
14
12
10
8
6
4
2
0
ORAL READING
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
60
SESSIONS


SUBJECT 2
BASE.
PEER TUTORING
MONEY SKILLS
EXPRESSIVE LANGUAGE
ORAL READING
SESSIONS

Appendix I

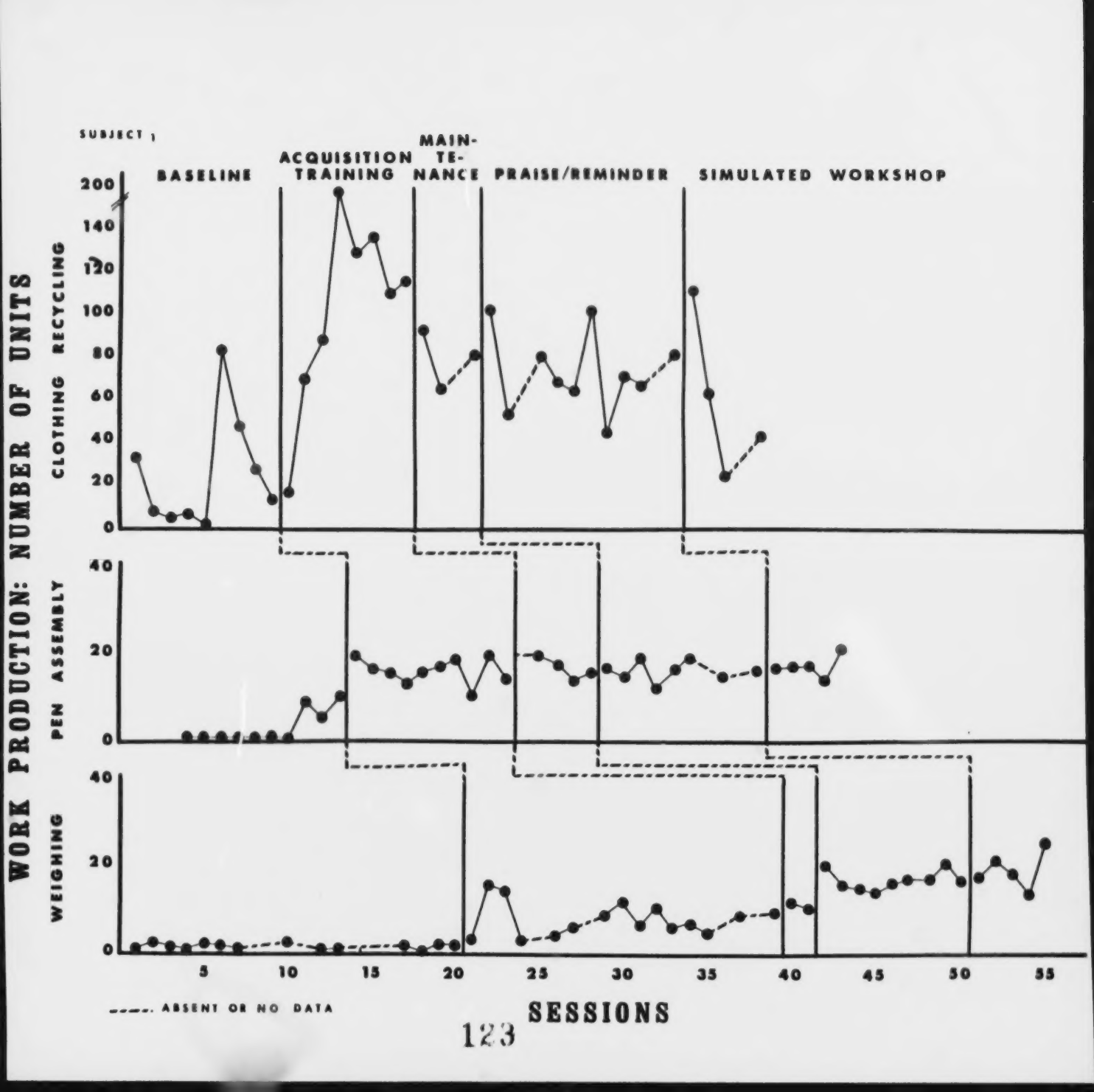
Study 4: Student Graphs

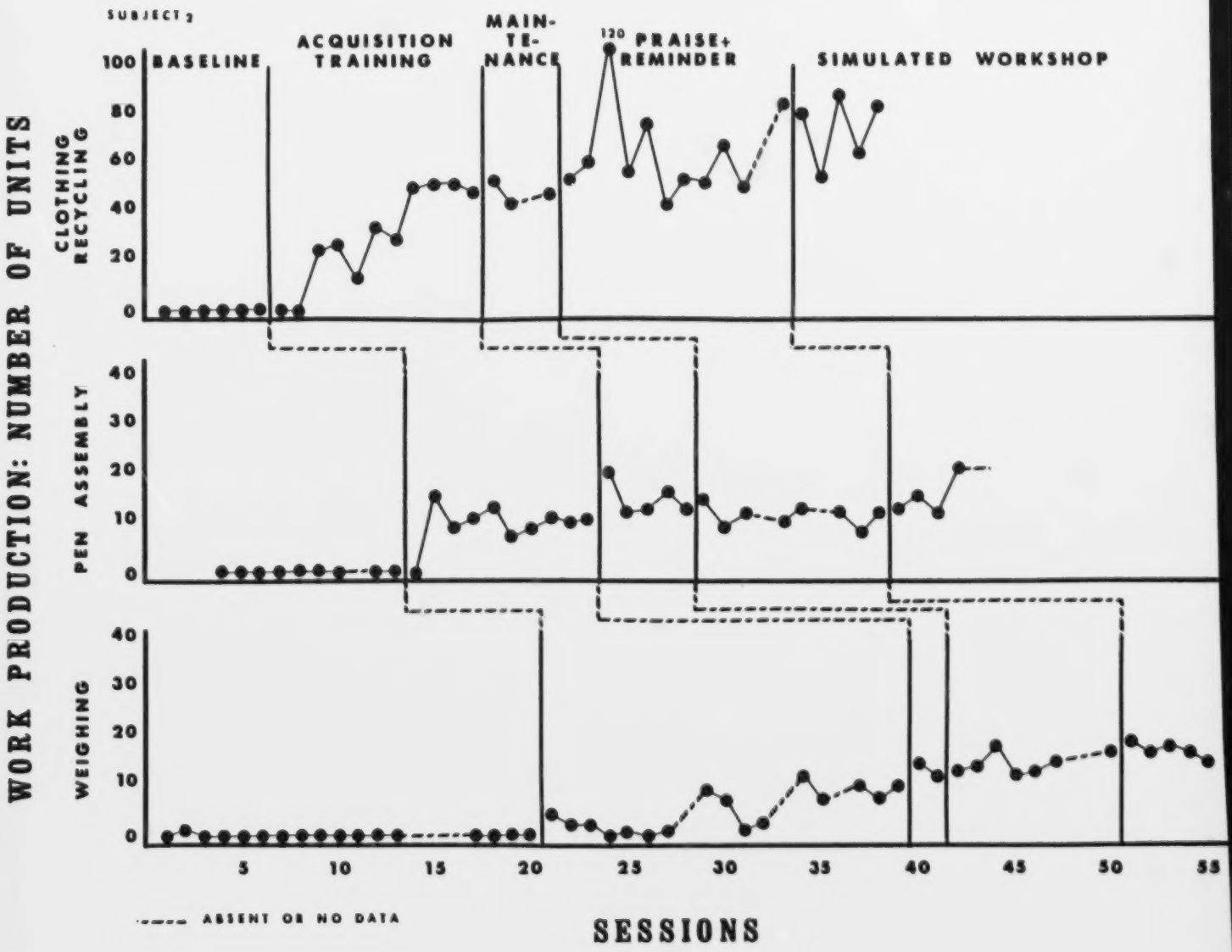

EXPERIMENT 1
TUTOR TRAINING
EXPERIMENT 2
GENERALIZATION
BASELINE
READ CARD
WAIT
"GOOD BOY"
TURN CARD
"NO"
"FINISHED"
PERCENT CORRECT RESPONSES
RETRAINING
SESSIONS

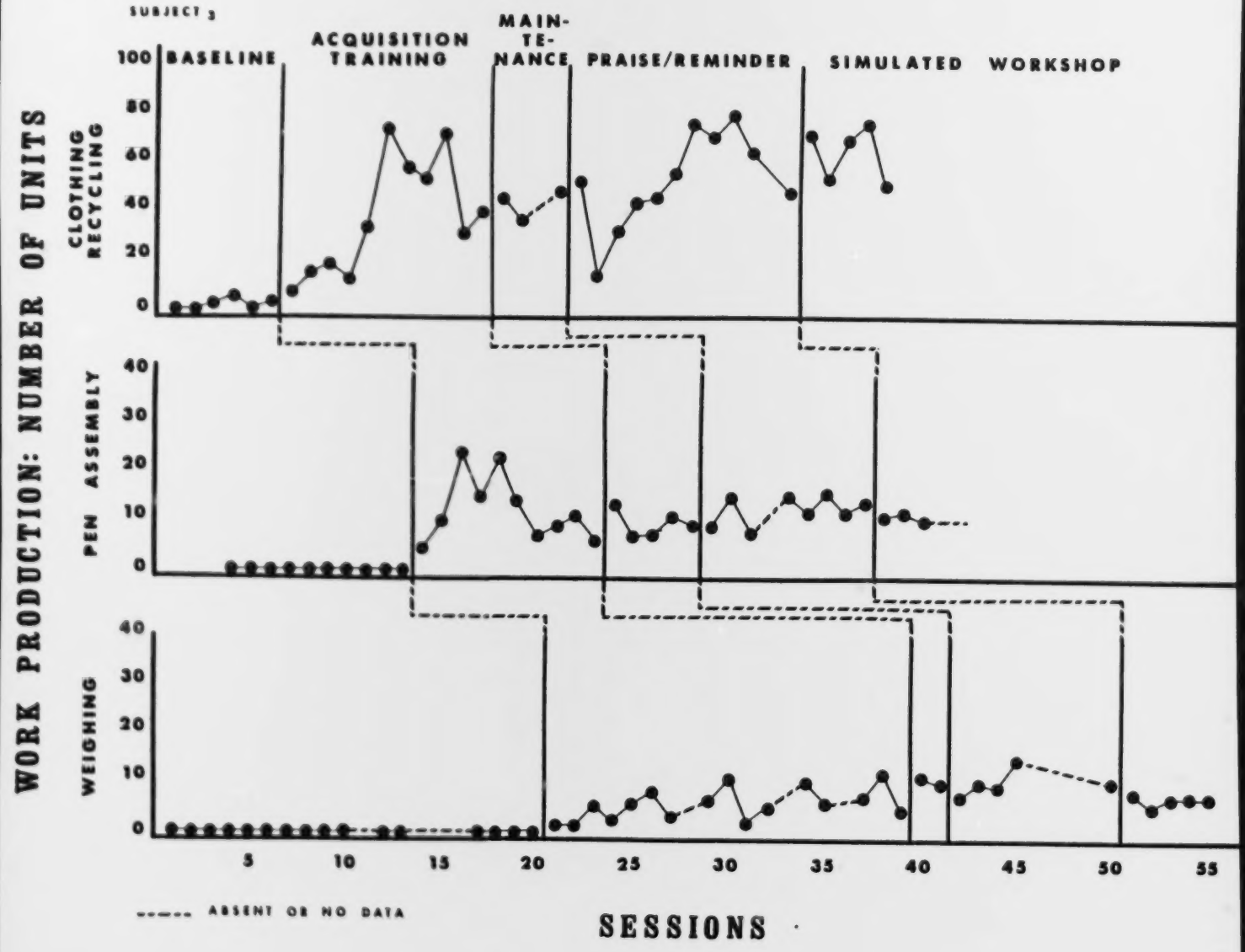

BASELINE
PEER TUTORING
POSTTEST
OPEN CONTAINER
SHAKE POPCORN
STAMP ENVELOPE
PERCENT CORRECT RESPONSES
100
80
60
40
20
0
5
10
15
20
RELIABILITY CHECK
MANUAL PROMPT
SESSIONS

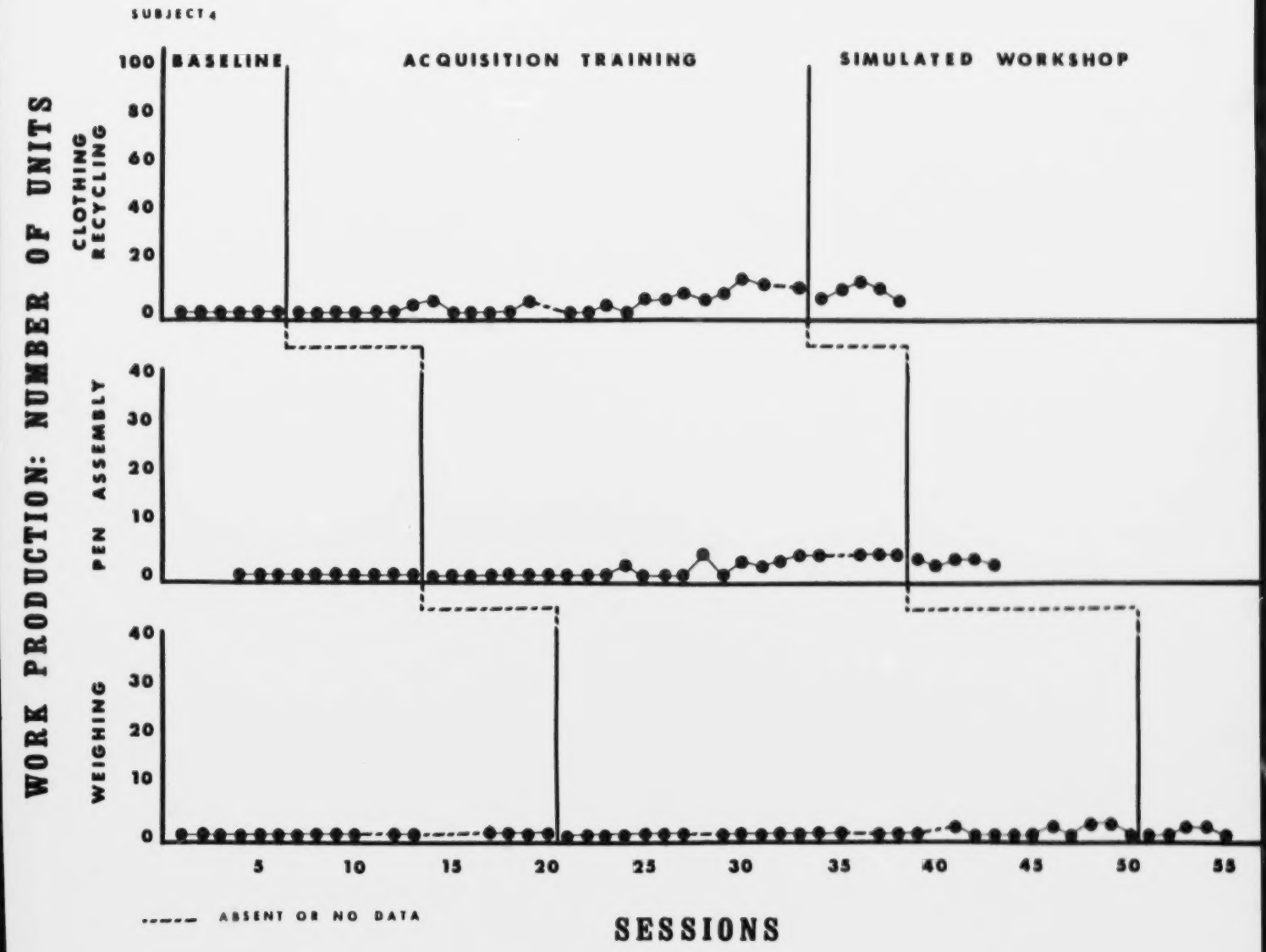
Appendix J

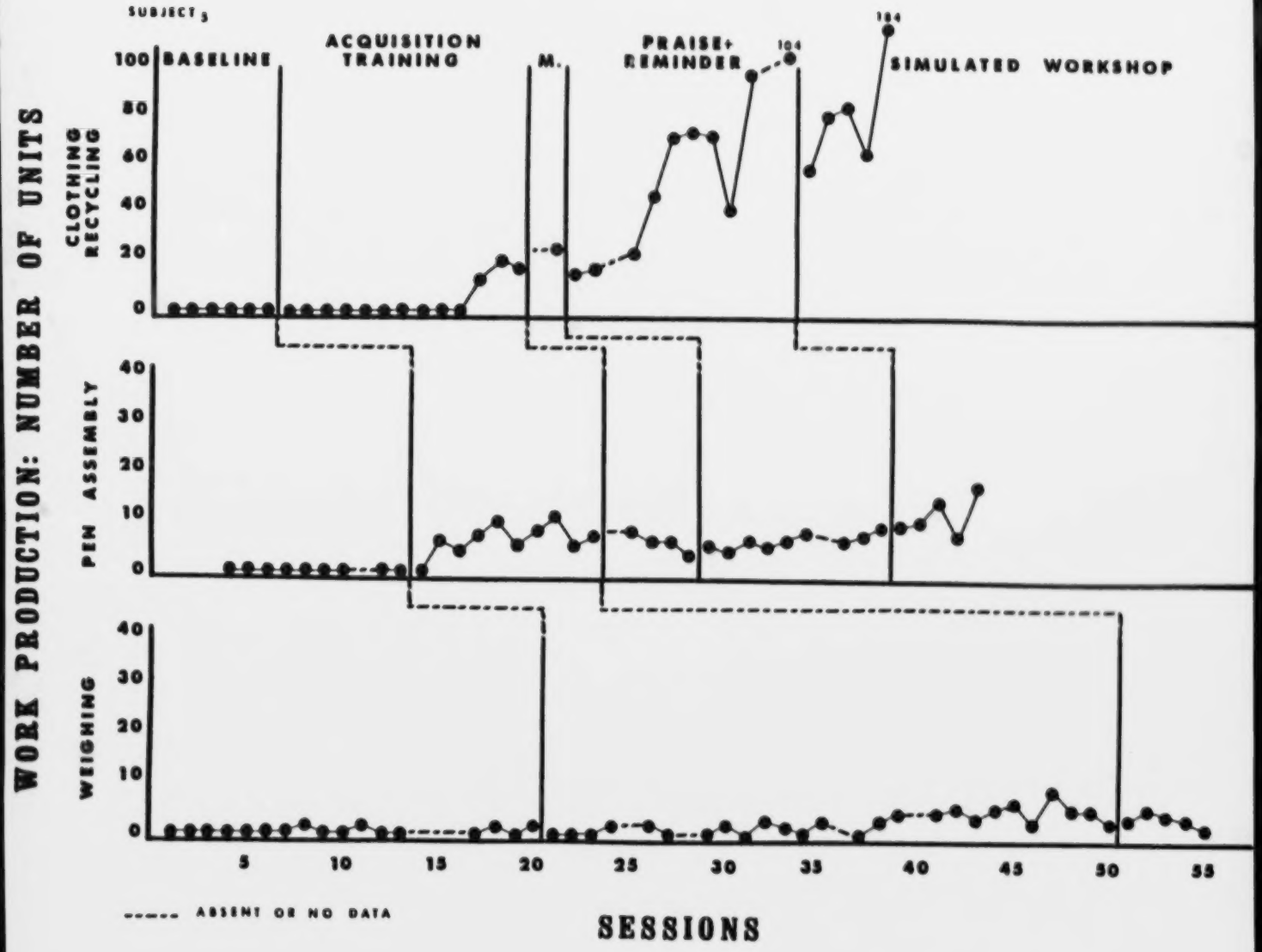
Study 5: Student Graphs

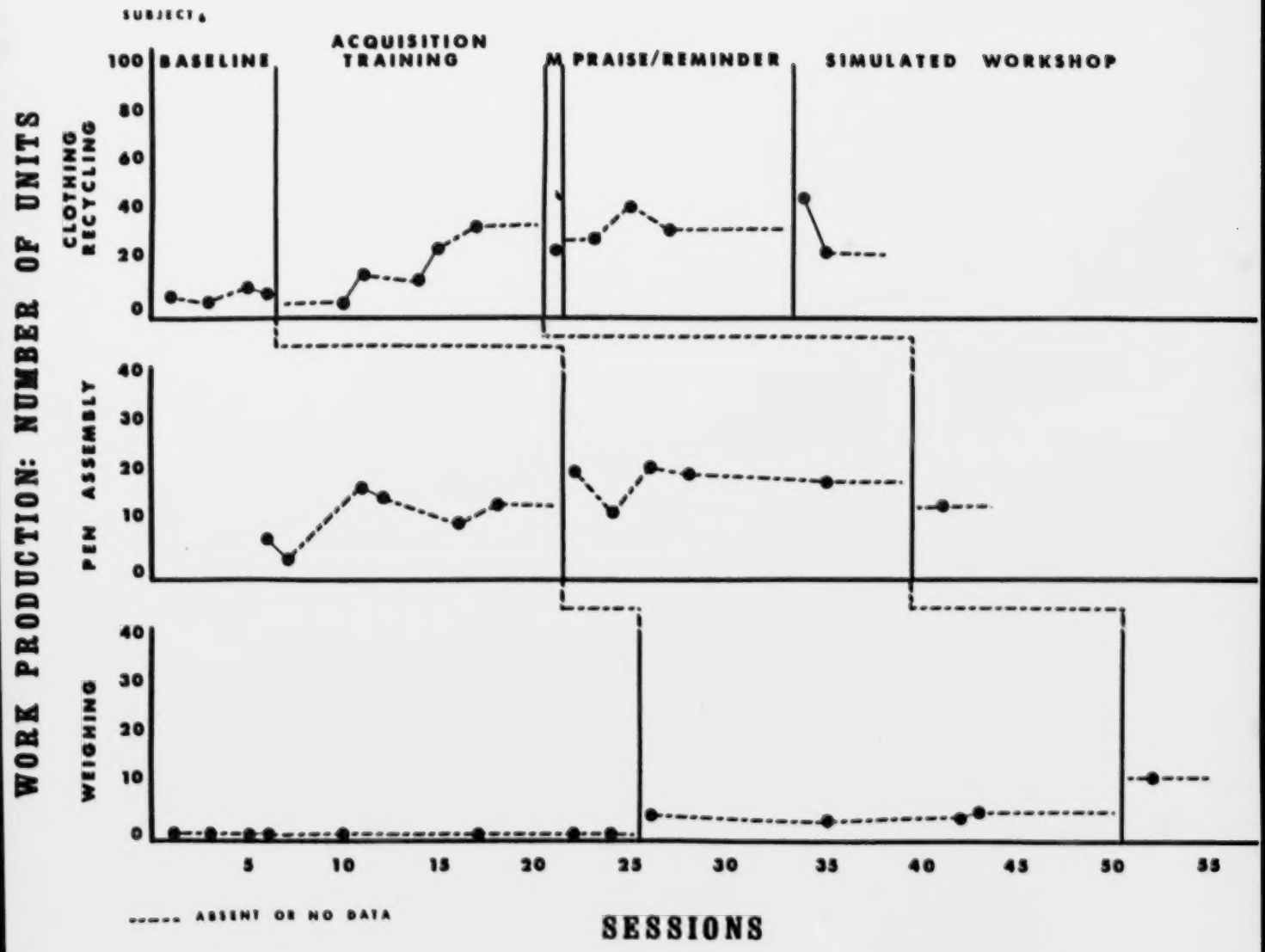

SUBJECT 1
BASELINE
ACQUISITION TRAINING
MAIN-TE-NANCE
PRAISE/REMINDER
SIMULATED WORKSHOP
WORK PRODUCTION: NUMBER OF UNITS
CLOTHING RECYCLING
PEN ASSEMBLY
WEIGHING
200
140
120
100
80
60
40
20
0
40
20
0
40
20
0
5
10
15
20
25
30
35
40
45
50
55
ABSENT OR NO DATA
SESSIONS


SUBJECT 2
BASELINE
ACQUISITION TRAINING
MAIN-TE-NANCE
120 PRAISE+ REMINDER
SIMULATED WORKSHOP
CLOTHING RECYCLING
PEN ASSEMBLY
WEIGHING
WORK PRODUCTION: NUMBER OF UNITS
ABSENT OR NO DATA
SESSIONS


SUBJECT 3
BASELINE
ACQUISITION TRAINING
MAIN-TE-NANCE
PRAISE/REMINDER
SIMULATED WORKSHOP
WORK PRODUCTION: NUMBER OF UNITS
CLOTHING RECYCLING
PEN ASSEMBLY
WEIGHING
100
80
60
40
20
0
40
30
20
10
0
5
10
15
20
25
30
35
40
45
50
55
ABSENT OR NO DATA
SESSIONS


SUBJECT 4
BASELINE
ACQUISITION TRAINING
SIMULATED WORKSHOP
CLOTHING RECYCLING
PEN ASSEMBLY
WEIGHING
WORK PRODUCTION: NUMBER OF UNITS
SESSIONS
ABSENT OR NO DATA


SUBJECT 3
BASELINE
ACQUISITION TRAINING
M.
PRAISE+ REMINDER
SIMULATED WORKSHOP
CLOTHING RECYCLING
PEN ASSEMBLY
WEIGHING
WORK PRODUCTION: NUMBER OF UNITS
SESSIONS
ABSENT OR NO DATA


SUBJECT 4
BASELINE
ACQUISITION TRAINING
PRAISE/REMINDER
SIMULATED WORKSHOP
CLOTHING RECYCLING
PEN ASSEMBLY
WEIGHING
WORK PRODUCTION: NUMBER OF UNITS
SESSIONS
ABSENT OR NO DATA

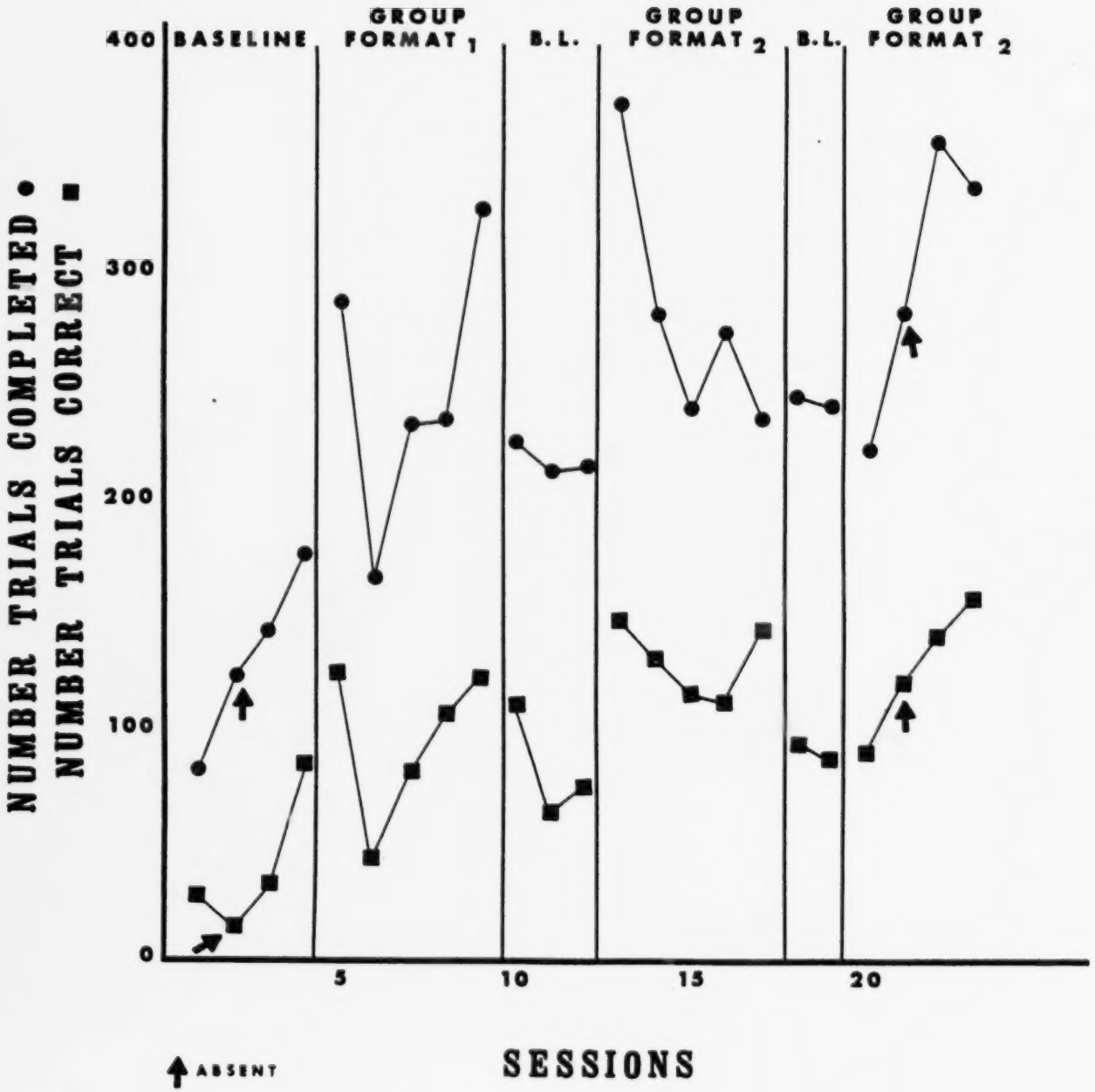
Appendix K

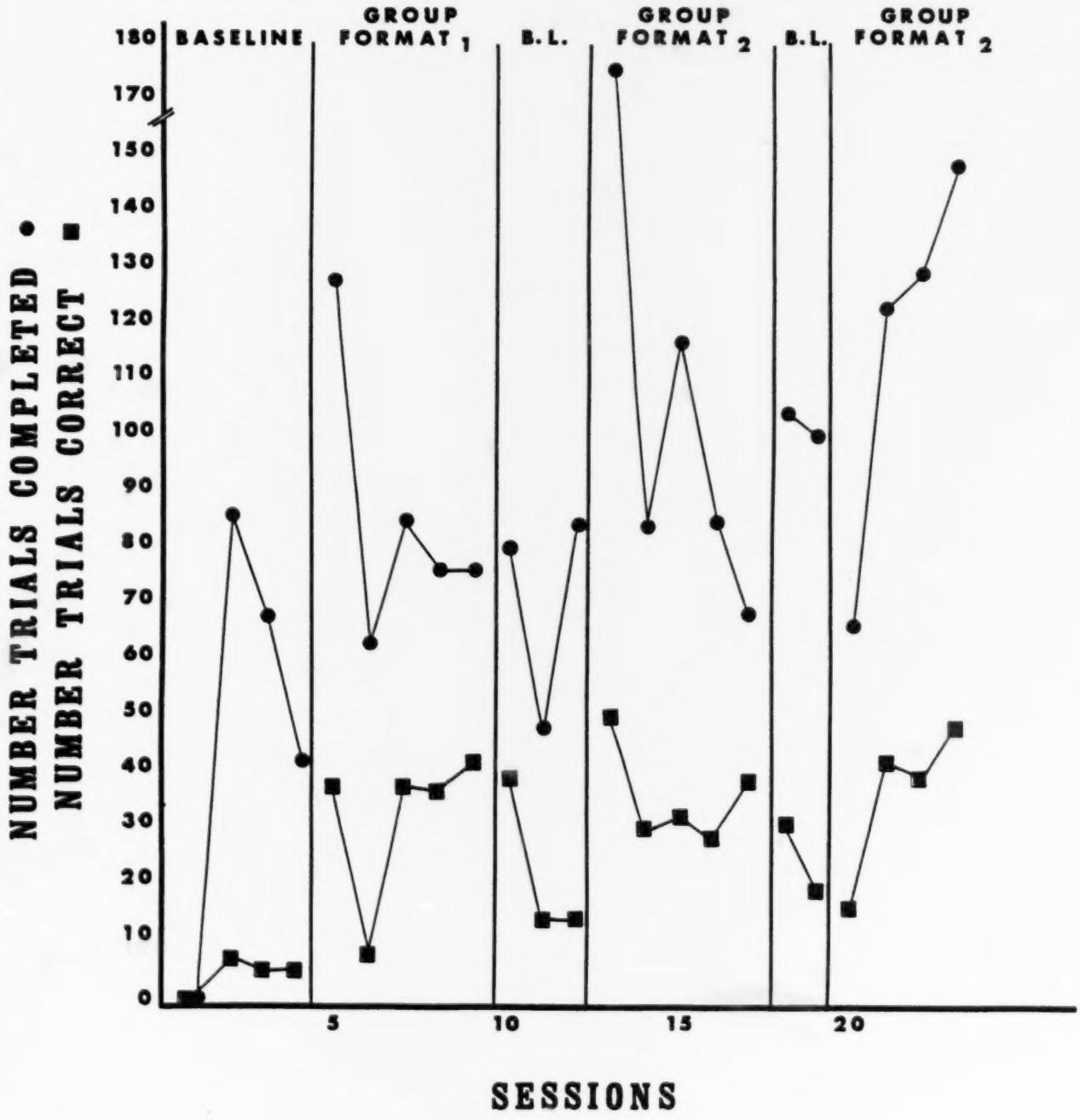
Study 6: Student Graphs

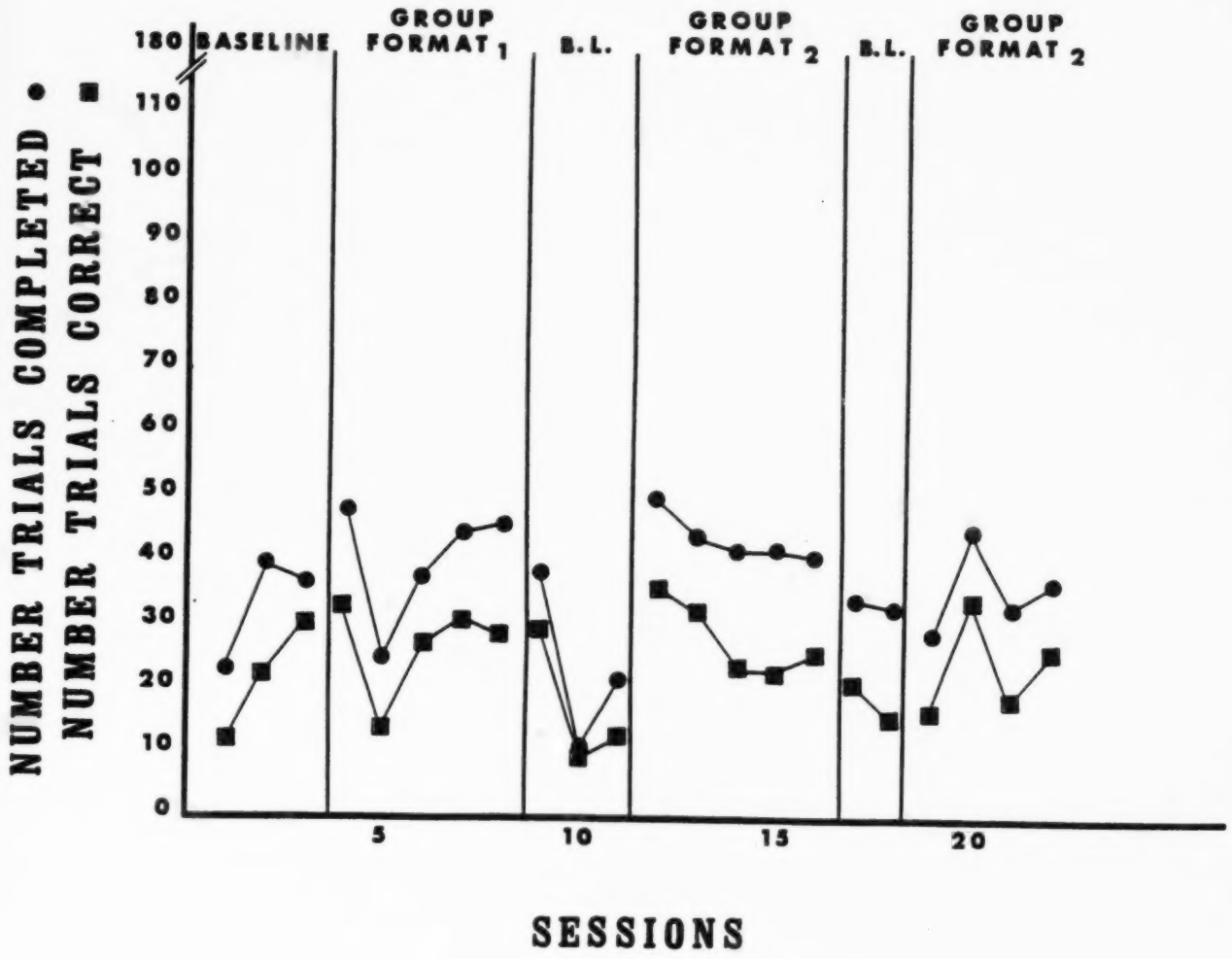
Table 2

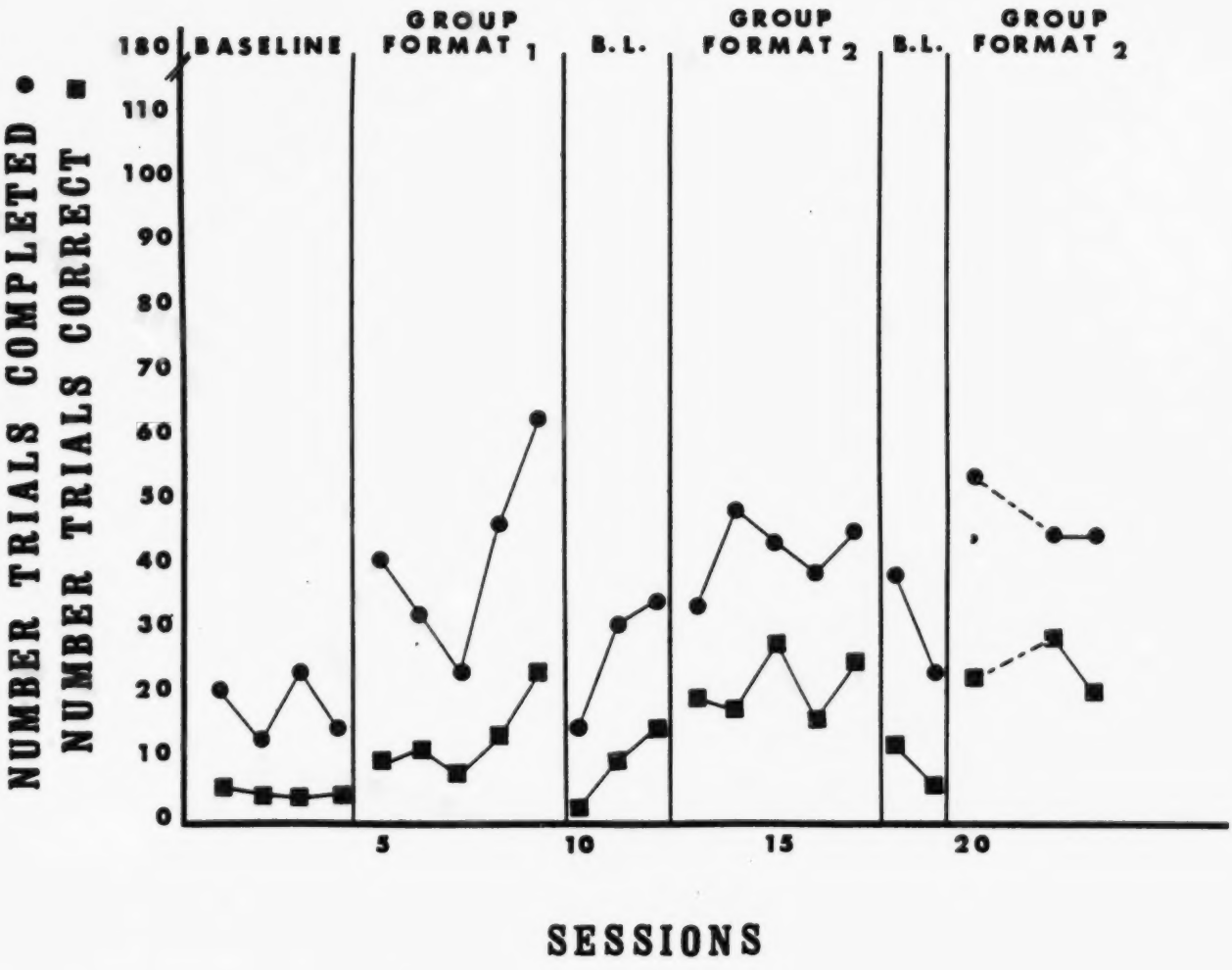
Range, mean, and number of reliability checks per individual student task.

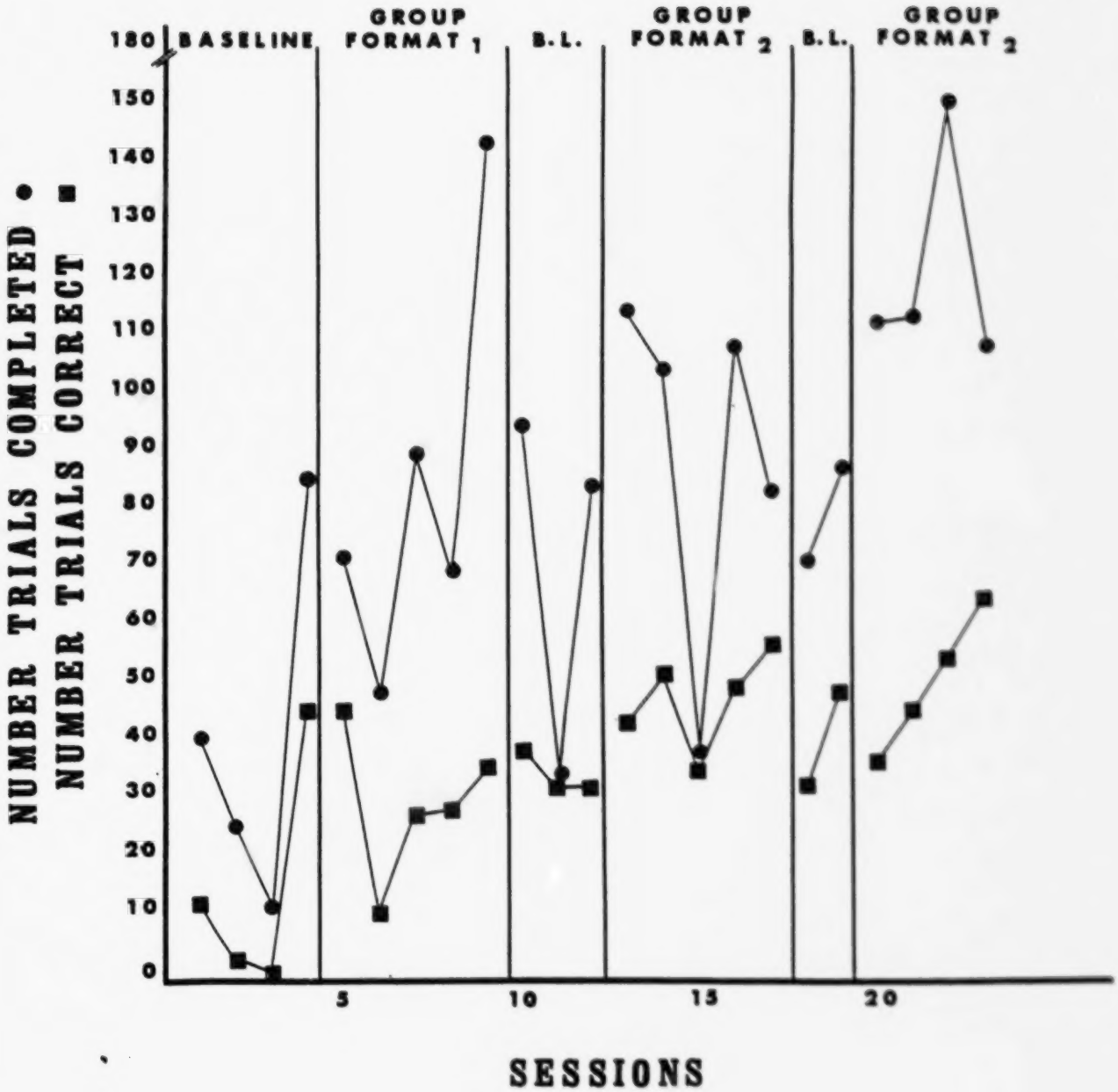
Child	Task	Range	Mean	Number Checks	Child	Task	Range	Mean	Number Checks
Harry	Hand-writing	83-100%	91%	11	Mike	Letter I.D.	92-100%	96%	3
	Addition	83-100%	97%	12		Action Phrases	83- 94%	90%	6
	Pronouns	50-100%	75%	6		Hand-writing	91-100%	96%	12
	Calender Skills 1	85-100%	93%	4		Tracing	67-100%	89%	12
	Calender Skills 2	89-100%	97%	4	Robert	Sight Words	88-100%	98%	10
Bobby	Letter I.D.	83-100%	93%	8		Subtrac-tion Facts	88-100%	99%	22
	Action Phrases	86-100%	98%	9		Hand-writing	25-100%	97%	10
	Number/ Object Matching	85-100%	99%	12		Subtrac-tion Work Sheets	100%	100%	10
	Letter Writing	50-100%	92%	11		Addition Worksheets	89-100%	98%	6
	Letter Tracing	11-100%	79%	9					

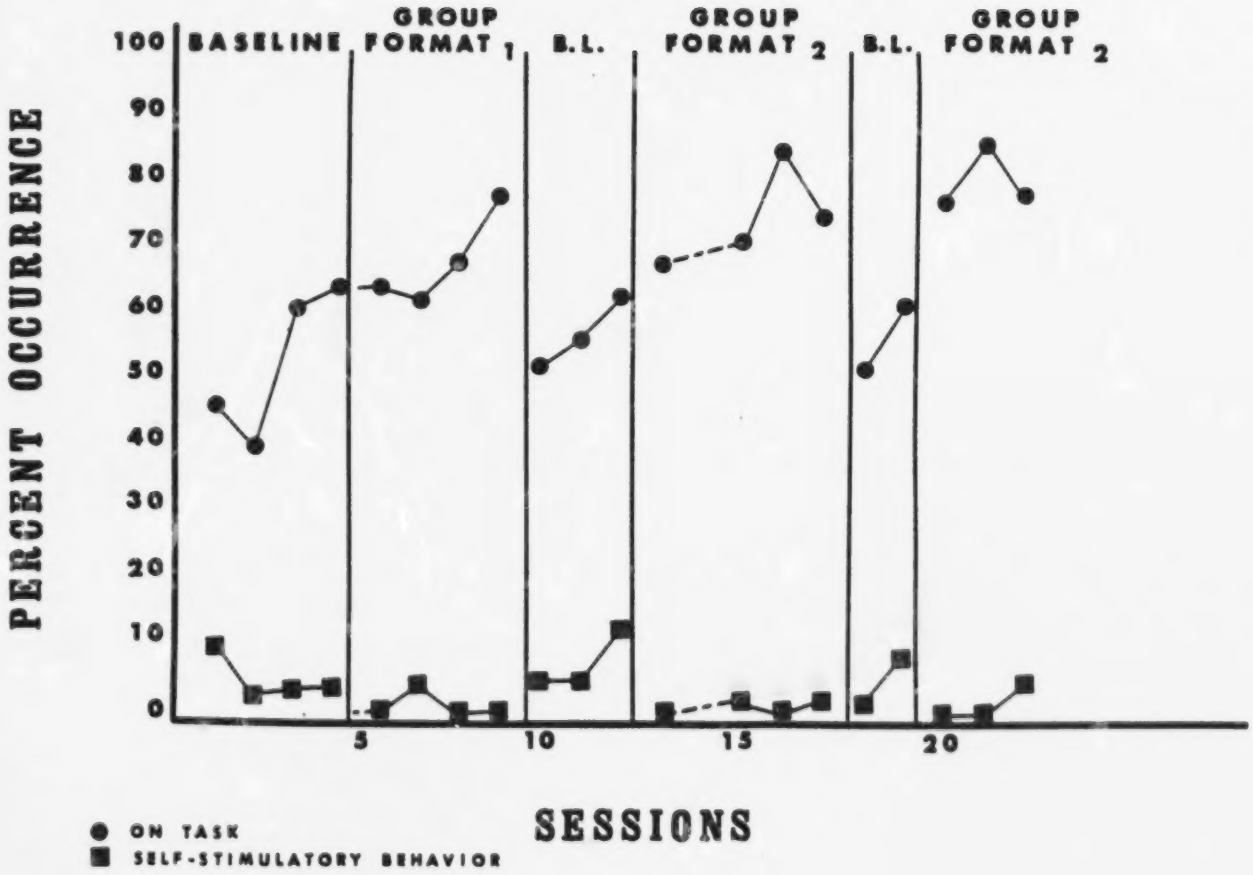

NUMBER TRIALS COMPLETED •
NUMBER TRIALS CORRECT ■
400
300
200
100
0
BASELINE
GROUP FORMAT 1
B.L.
GROUP FORMAT 2
B.L.
GROUP FORMAT 2
5
10
15
20
ABSENT
SESSIONS


BASELINE
GROUP FORMAT 1
B.L.
GROUP FORMAT 2
B.L.
GROUP FORMAT 2
180
170
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
NUMBER TRIALS COMPLETED ●
NUMBER TRIALS CORRECT ■
SESSIONS


NUMBER TRIALS COMPLETED ●
NUMBER TRIALS CORRECT ■
180
110
100
90
80
70
60
50
40
30
20
10
0
BASELINE
GROUP FORMAT 1
B.L.
GROUP FORMAT 2
B.L.
GROUP FORMAT 2
5
10
15
20
SESSIONS

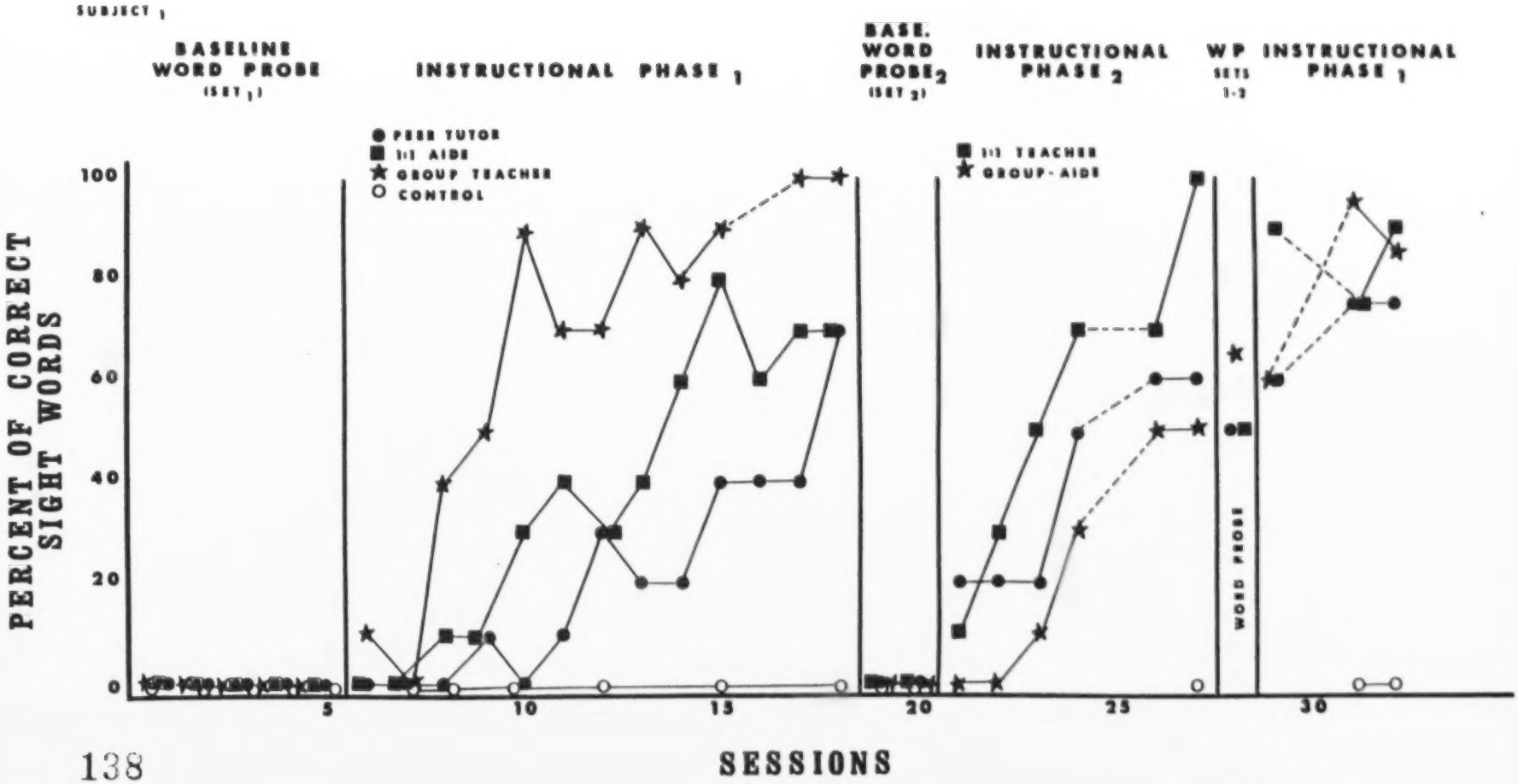

NUMBER TRIALS COMPLETED •
NUMBER TRIALS CORRECT ■
180
110
100
90
80
70
60
50
40
30
20
10
0
BASELINE
GROUP FORMAT 1
B.L.
GROUP FORMAT 2
B.L.
GROUP FORMAT 2
5
10
15
20
SESSIONS

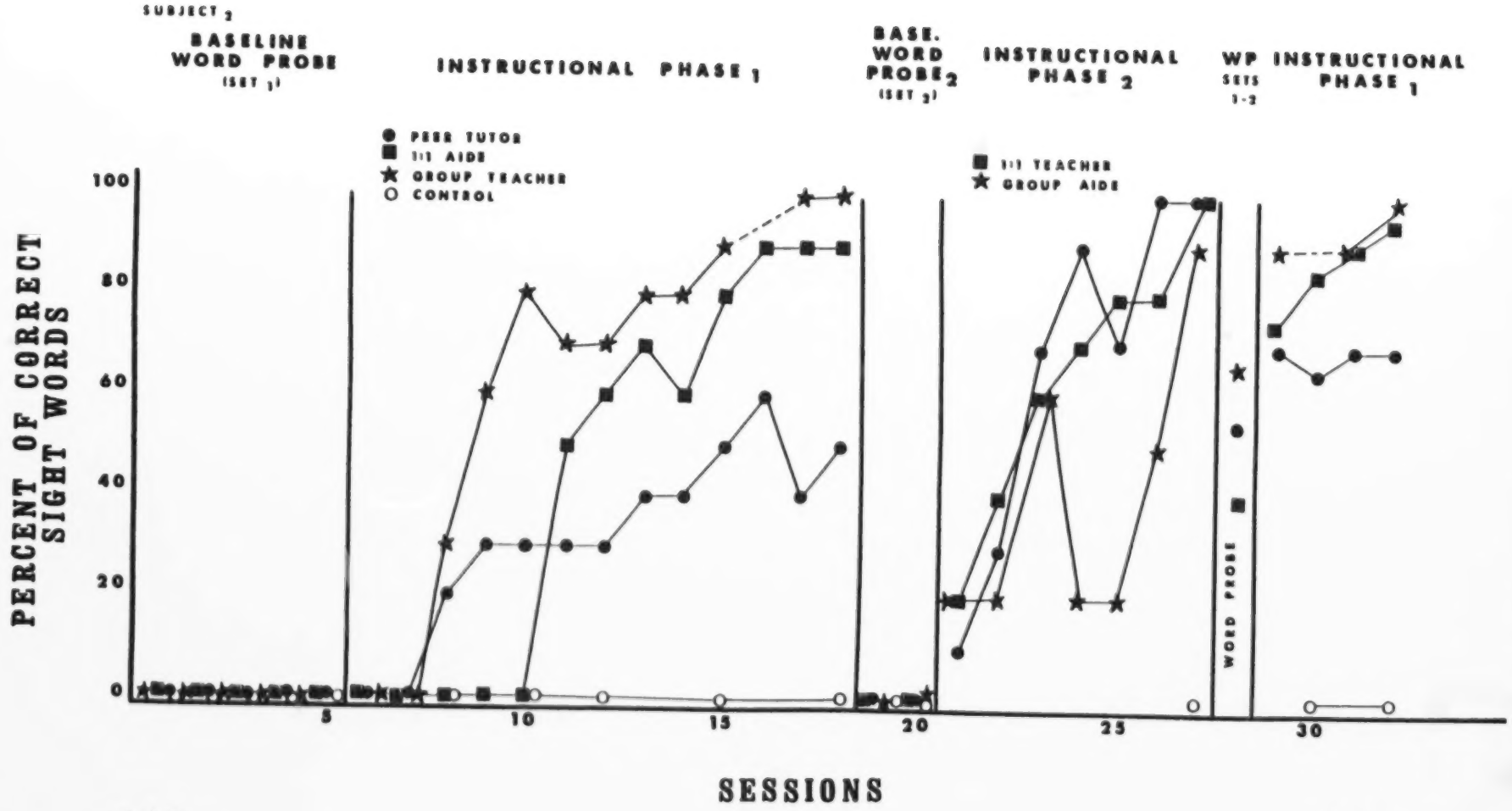

NUMBER TRIALS COMPLETED •
NUMBER TRIALS CORRECT ■
180
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
BASELINE
GROUP FORMAT 1
B.L.
GROUP FORMAT 2
B.L.
GROUP FORMAT 2
5
10
15
20
SESSIONS

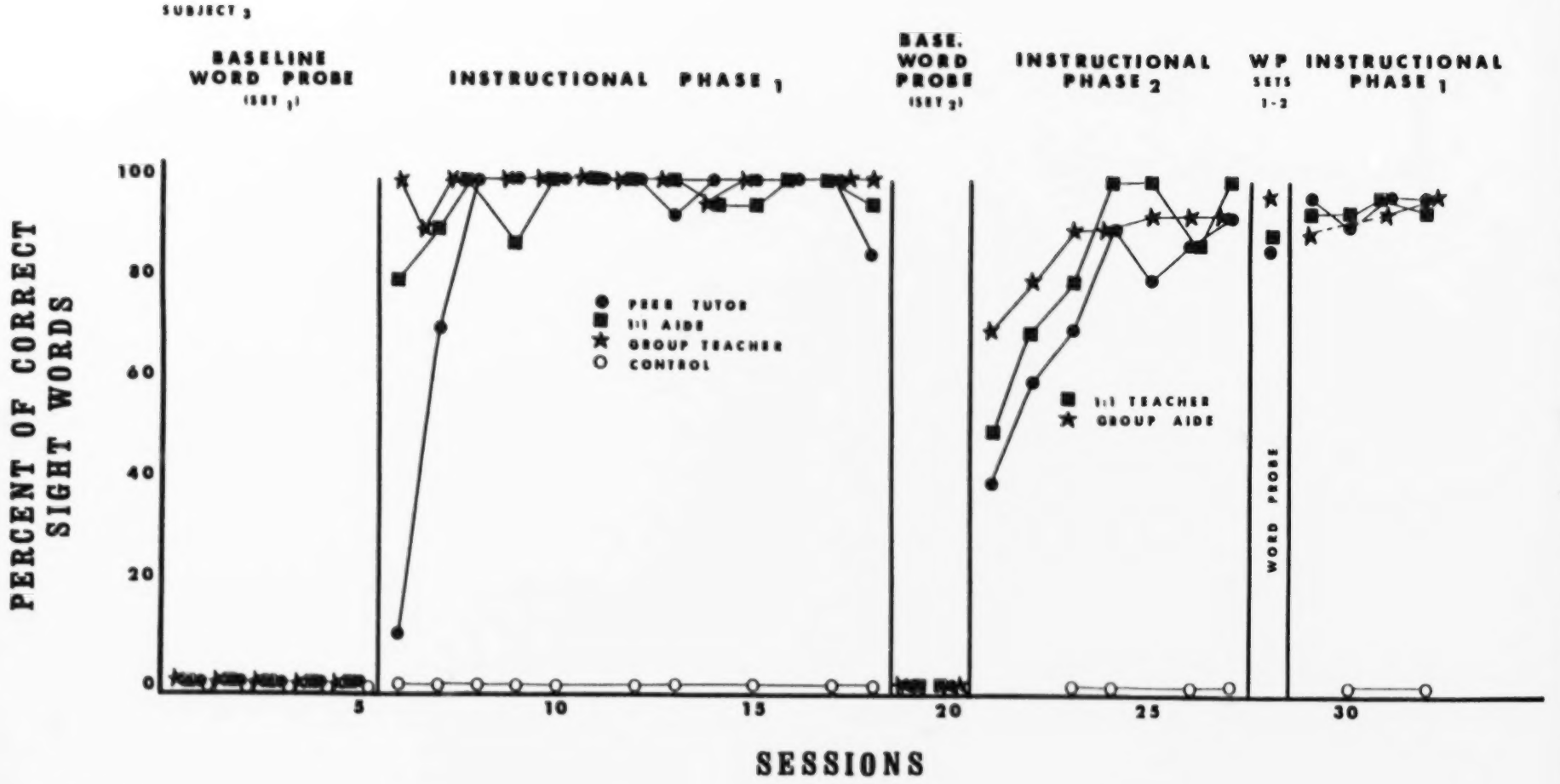

PERCENT OCCURRENCE
100
90
80
70
60
50
40
30
20
10
0
BASELINE
GROUP FORMAT 1
B.L.
GROUP FORMAT 2
B.L.
GROUP FORMAT 2
5
10
15
20
SESSIONS
ON TASK
SELF-STIMULATORY BEHAVIOR

Appendix L

Study 7: Student Graphs


SUBJECT 1
BASELINE WORD PROBE (SET 1)
INSTRUCTIONAL PHASE 1
BASE. WORD PROBE 2 (SET 3)
INSTRUCTIONAL PHASE 2
WP SETS 1-2
INSTRUCTIONAL PHASE 1
PEER TUTOR
1:1 AIDE
GROUP TEACHER
CONTROL
1:1 TEACHER
GROUP-AIDE
WORD PROBE
PERCENT OF CORRECT SIGHT WORDS
100
80
60
40
20
0
5
10
15
20
25
30
SESSIONS


SUBJECT 2
BASELINE WORD PROBE (SET 1)
INSTRUCTIONAL PHASE 1
BASE. WORD PROBE 2 (SET 3)
INSTRUCTIONAL PHASE 2
WP SETS 1-2
INSTRUCTIONAL PHASE 1
PEER TUTOR
1:1 AIDE
GROUP TEACHER
CONTROL
1:1 TEACHER
GROUP AIDE
WORD PROBE
PERCENT OF CORRECT SIGHT WORDS
100
80
60
40
20
0
5
10
15
20
25
30
SESSIONS

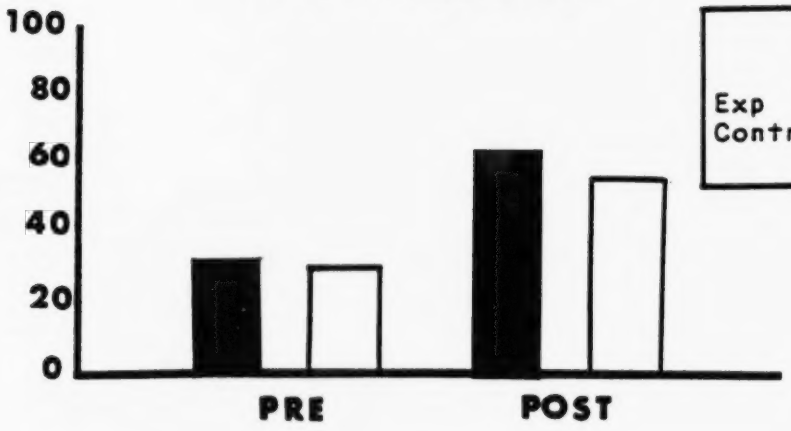

SUBJECT 3
BASELINE WORD PROBE (SET 1)
INSTRUCTIONAL PHASE 1
BASE. WORD PROBE (SET 3)
INSTRUCTIONAL PHASE 2
WP SETS 1-2
INSTRUCTIONAL PHASE 1
PERCENT OF CORRECT SIGHT WORDS
100
80
60
40
20
0
5
10
15
20
25
30
SESSIONS
PEER TUTOR
1:1 AIDE
GROUP TEACHER
CONTROL
1:1 TEACHER
GROUP AIDE
WORD PROBE

Appendix M

Study 8: Student Graphs

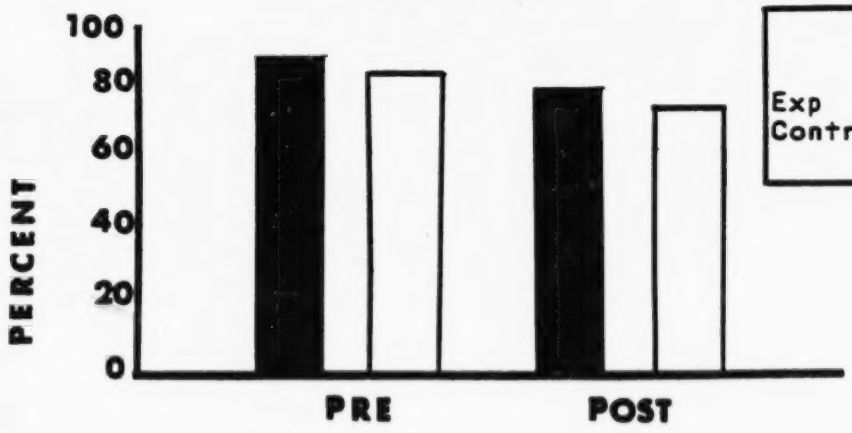
GROUP TEACHING STUDY 1

TASK ACQUISITION



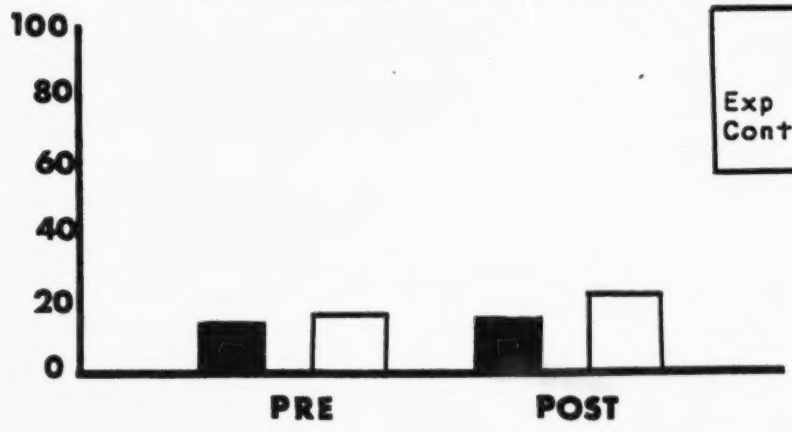
	Pre	Post	Gain
Exp	30%	62%	32%
Control	29%	52%	23%

ON TASK



	Pre	Post	Difference
Exp	89%	81%	-8%
Control	83%	77%	-6%

SELF-STIMULATORY BEHAVIOR



	Pre	Post	Difference
Exp	15%	15%	0%
Control	19%	20%	1%

Table 1

Pre and Posttest Percentage Correct for Experimental and Control Groups

	Experimental				Control			
	Student#	Pre	Post	Gain	Student#	Pre	Post	Gain
	1	26	63	37	28	23	56	33
	2	33	72	39	29	28	40	12
Money	3	19	42	23	30	26	56	30
	4	42	58	16				
	5	30	51	21				
	6	45	86	41	31	7	35	28
	7	48	91	43	32	12	37	25
Readiness	8	7	30	23	33	57	85	28
	9	45	77	32	34	74	94	20
	10	43	90	47				
	11	10	43	33				
Language	12	30	73	43				
	13	50	86	36				
	14	33	73	40				
	15	57	90	33				
	16	48	72	24	35	49	80	31
Shopping	17	26	49	23	36	31	67	36
	18	52	92	40	37	12	39	27
	19	32	50	18				
	20	8	36	28	38	26	16	-10
Language	21	11	39	28	39	19	28	9
	22	11	29	18				
	23	20	42	22				
	24	23	54	31	40	28	65	37
Language	25	27	65	38	41	15	31	16
	26	24	65	41				
	27	20	55	35				
		—	—	—		—	—	—
n =	27				n = 14			
		Pre 30%		Post 62%		Pre 29%		Post 52%
		% Gain = 32%				% Gain = 23%		

Table 2

Pre and Post On-Task Percentages for Experimental and Control Groups

	Experimental				Control			
	Student#	Pre	Post	Dif	Student#	Pre	Post	Dif
Money	1	85	81	- 4	28	100	95	- 5
	2	100	84	-16	29	75	79	+ 4
	3	95	96	+ 1	30	83	73	-10
	4	80	96	+16				
	5	100	90	-10				
Readiness	6	60	64	+ 4	31	88	78	-10
	7	95	97	+ 2	32	90	75	-15
	8	88	83	- 5	33	55	78	+23
	9	90	94	+ 4	34	100	95	- 5
Language	10	100	93	- 7				
	11	100	76	-24				
	12	100	74	-26				
	13	100	83	-17				
	14	95	88	- 7				
	15	100	76	-24				
Shopping	16	100	96	- 4	35	100	86	-14
	17	88	74	-14	36	100	88	-12
	18	100	98	- 2	37	90	65	-25
	19	100	91	- 9				
Language	20	70	81	+11	38	55	40	-15
	21	73	54	-19	39	50	41	- 9
	22	75	75	0				
	23	73	73	0				
Language	24	80	54	-26	40	90	97	+ 7
	25	82	73	- 9	41	85	87	+ 2
	26	90	60	-30				
	27	83	70	-13				
		—	—	—		—	—	—
	Pre = x = 89%		Post = 81%		Pre 83%		Post 77%	
	Difference = - 8%				Difference = - 6%			

Reliability: Mean = 94%
Range = 45 to 100%

Appendix P

Study 9: Pre/Post Manual Check

Table 3

Pre and Post Self-Stimulatory Percentages for Experimental and Control Groups

	Experimental				Control			
	Student#	Pre	Post	Dif	Student#	Pre	Post	Dif
Money	1	3	13	+10	28	0	9	+ 9
	2	10	46	+36	29	25	20	- 5
	3	0	1	+ 1	30	15	17	+ 2
	4	0	5	+ 5				
	5	30	16	-14				
Readiness	6	68	49	-19	31	50	70	+20
	7	20	15	- 5	32	35	60	+25
	8	0	1	+ 1	33	45	24	-21
	9	5	0	- 5	34	10	12	+ 2
Language	10	28	3	-25				
	11	5	4	- 1				
	12	35	50	+15				
	13	3	14	+11				
	14	45	54	+ 9				
	15	30	29	- 1				
Shopping	16	18	5	-13	35	28	28	0
	17	75	66	- 9	36	18	1	-17
	18	10	8	- 2	37	18	5	-13
	19	8	4	- 4				
Language	20	0	5	+ 5	38	18	8	-10
	21	10	15	+ 5	39	5	20	+15
	22	0	1	+ 1				
	23	5	3	- 2				
Language	24	0	1	+ 1	40	0	0	0
	25	8	3	- 5	41	3	0	- 3
	26	0	3	+ 3				
	27	0	0	0				
		—	—	—		—	—	—
n = 27								
		Pre 15%	Post 15%			Pre 19%	Post 20%	
		Difference = 0%				Difference = + 1%		

Reliability: Mean = 94%
Range = 50 to 100%

Appendix N

Study 8: Teacher Data

Mean Frequencies of Teacher Behavior Per Five-Minute Observations During One-to-One Baseline Formats With All Students

Teacher	$\bar{X}$ #Trials	$\bar{X}$ #Models	$\bar{X}$ #Prompts	$\bar{X}$ #Reinforcements	$\bar{X}$ #Feedback
A	14.0	2.4	16.0	18.0	2.0
B	8.0	4.3	19.0	11.0	2.0
C	24.0	6.0	16.0	19.0	4.0
D	15.0	10.4	19.3	13.0	5.0
E	20.0	14.0	29.0	23.0	----
F	21.0	14.2	20.0	15.0	____
Range	5.0 - 30.0	.5 - 33.0	1 - 48	4.0 - 28.0	0 - 9.0

Number of Students = 41

Number of Observations = 83 (33% of total sessions)

Reliability: Mean = 90%

Appendix O

Study 9: Feedback Techniques

F E E D B A C K G U I D E L I N E S

BOTH TONE AND CONTENT NEED TO BE CONSIDERED WHEN GIVING VERBAL OR WRITTEN FEEDBACK. THE TONE IN WHICH CRITICAL OR INSTRUCTIONAL FEEDBACK IS DELIVERED IS PROBABLY THE DECIDING FACTOR OF WHETHER OR NOT THE TEACHER WILL ACCEPT AND USE THE GIVEN SUGGESTIONS. THE PERSON GIVING FEEDBACK SHOULD HAVE A POSITIVE ATTITUDE, AND GIVE RECOMMENDATIONS IN A TACTFUL, BUT CONFIDENT WAY. IN CONSIDERING CONTENT, BE SURE THAT COMMENTS ARE SPECIFIC, AND QUANTITATIVE, AND ALWAYS GIVE SUGGESTIONS ON HOW TO IMPROVE THE SPECFIC BEHAVIOR(S).

<u>GUIDELINES</u>

1. APPROACH IN A NON-THREATENING, BUT CONFIDENT MANNER.
2. BEGIN WITH A POSTIVE STATEMENT (SOMETHING WELL DONE, IMPROVED OR MAINTAINING).
3. DEFINE THE BEHAVIOR NEEDING IMPROVEMENT.
4. GIVE SPECIFIC SUGGESTIONS ON HOW TO CHANGE/IMPROVE THE BEHAVIOR(S)
5. ALLOW TEACHER TO RESPOND. THE PERSON GIVING FEEDBACK SHOULD BE SENSITIVE TO PROBLEMS THE TEACHER MAY HAVE WITH PARTICULAR SUGGESTIONS. THE CONSULTANT SHOULD BE OPEN TO COMPROMISE IF APPROPRIATE.
6. AVOID COMMENTS THAT SOUND PATRONIZING OR CONDESCENDING.
7. ALWAYS END A FEEDBACK SESSION POSITIVELY.

Please circle all answers that apply to each question.

GROUP TEACHING PROCEDURES

1. Does group teaching require:
   a. An all new curriculum.
   b. Selection of specific existing content areas to be taught in a group format.

2. Which tasks would be appropriate for teaching in a group format?
   a. One that required physical guidance for a student 80% of the time in a 1:1 situation.
   b. One in an area in which previous demonstration of some skills was noted.
   c. Acquisition of prevocational/vocational skills.

3. In a group format, the students are required to engage in the same task, simultaneously.
   a. True
   b. False

4. It is best not to place verbal and non-verbal students in the same teaching group.
   a. True
   b. False

5. Teaching in a group requires more samples of the same materials.
   a. True
   b. False

6. Fast pacing (trial presentation) will disrupt the flow of a group format.
   a. True
   b. False

7. Which of the following correction techniques are appropriate options in group formats?
   a. Teacher models answer for students.
   b. Teacher asks a second student to model the response.
   c. Teacher prompts the student.

8. Two methods of maintaining students' interest during a group teaching session may include: interspersing known with unknown tasks and providing "rest periods" between trials, where no response is required.
   a. True
   b. False

9. When conducting group teaching it is beneficial to allow one student to observe/participate in another student's lesson.
   a. True
   b. False

10. When selecting curriculum materials for teaching in a group, it is best to:
   a. Use the same items for each group session.
   b. Use a variety of materials to maintain student interest.

11. Which of the following behavior managment strategies are appropriate during group teaching?
   a. Edibles.
   b. Verbal praise.
   c. Tokens.

12. It is inefficient to have high and low functioning students in the same group.
   a. True
   b. False

13. In a group format such as this, with 6 students and 2 teachers, which would be the most efficient positions for the teachers? (Label as T.)

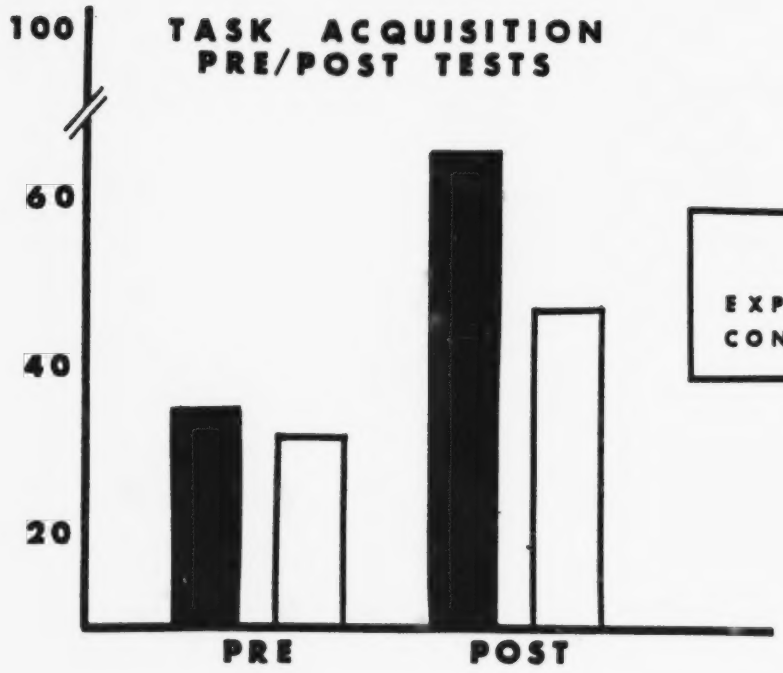
14. In a group format such as this, with 5 students and 1 teacher (T), where would you seat the most potentially disruptive student? (Label as S.)

15. All students in the group should always be allowed to remain with the group for the entire session.
   a. True
   b. False

Appendix Q

Study 9: Student Graphs

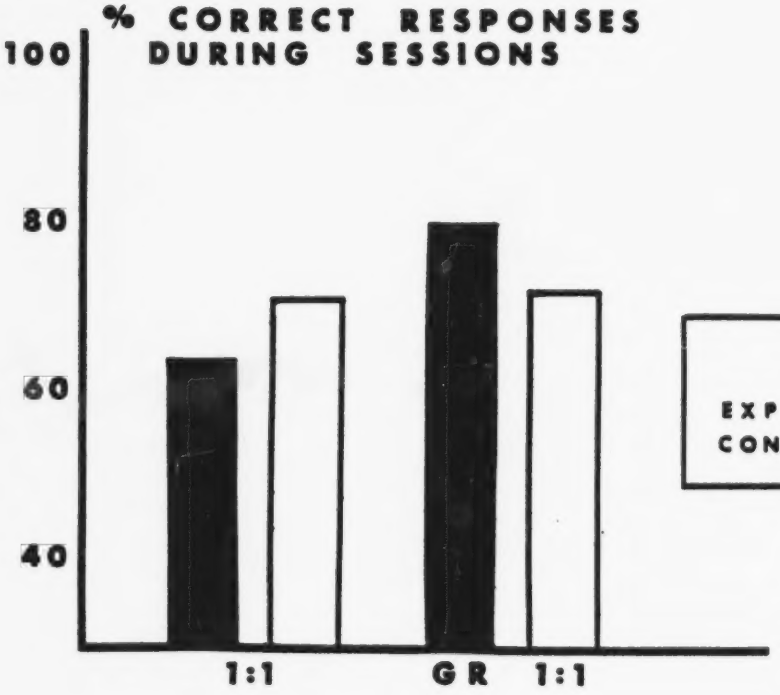
Group Teaching Study 2



	PRE	POST	GAIN
EXP	36%	67%	31%
CONTROL	33%	48%	15%

EXP

CONTROL



	1:1	GR/1:1	GAIN
EXP	65%	81%	16%
CONTROL	72%	73%	1%

PRE - PRE TEST
POST - POST TEST
1:1 - ONE TO ONE CONDITION
GR - GROUP CONDITION

Table 1

Pre and Posttest Percentage Correct for Experimental and Control Groups

	Experimental				Control			
	Student#	Pre	Post	Gain	Student#	Pre	Post	Gain
Math Skills	1	46	69	23	20	35	62	27
	2	31	85	54				
	3	57	90	33				
	4	48	85	37	21	54	89	35
Time Skills	5	41	72	31				
	6	57	81	24				
	7	13	37	24				
	8	39	82	43				
Time Skills	9	48	84	36				
	10	29	34	5				
Language & Counting	11	10	37	27	22	30	33	3
	12	47	80	33	23	30	30	0
	13	17	43	26				
	14	48	76	28	24	30	53	22
Shopping	15	26	42	16	25	17	23	6
	16	50	88	38				
	17	33	71	38				
	18	28	69	41				
Language	19	10	52	42				
		--	--	--		--	--	--
n = 19					n = 6			
		Pre 36%	Post 67%			Pre 33%	Post 48%	
		% Gain = 31%				% Gain = 15%		

Table 2

Pre and Post On-Task Percentages for Experimental and Control Groups

	Experimental				Control			
	Student#	Pre	Post	Dif	Student#	Pre	Post	Dif
Math Skills	1	82	75	- 7	20	83	96	+13
	2	97	86	-11				
	3	37	94	+57				
	4	97	99	+ 2	21	100	100	0
Time	5	30	97	+67				
Skills	6	82	98	+16				
	7	88	98	+10				
	8	97	98	+ 1				
Time	9	100	77	-23				
Skills	10	100	79	-21				
Language	11	74	60	-14	22	75	90	+15
&	12	65	85	+20	23	78	76	- 2
Counting	13	100	99	- 1				
	14	90	82	- 8	24	63	91	+28
Shopping	15	87	83	- 4	25	52	53	+ 1
	16	83	80	- 3				
	17	93	86	- 7				
	18	98	97	- 1				
Language	19	98	90	- 8				
		--	--	--		--	--	--
	n = 19				n =6			
		Pre = x = 84%	Post = 88%			Pre 75%	Post 84%	
		Difference = + 4%				Difference = + 9%		
Reliability:	Mean = 95%							
	Range = 71 to 100%							

Table 3

Pre and Post Self-Stimulatory Percentages for Experimental and Control Groups

	Experimental				Control			
	Student#	Pre	Post	Dif	Student#	Pre	Post	Dif
Math	1	0	1	+ 1	20	2	0	- 2
	2	7	1	- 6				
	3	0	6	+ 6				
	4	0	0	0	21	0	0	0
Time	5	2	49	+47				
Skills	6	0	0	0				
	7	15	1	-14				
	8	0	0	0				
Time	9	0	14	+14				
Skills	10	3	0	- 3				
Language	11	7	17	+10	22	0	14	+14
&	12	10	12	+ 2	23	0	2	+ 2
Counting	13	0	0	0				
	14	0	7	+ 7	24	52	38	+14
Shopping	15	4	4	0	25	9	4	- 5
	16	26	33	+ 7				
	17	8	21	+13				
	18	0	0	0				
Language	19	0	0	0				
		--	--	--		--	--	--
	n = 19				n =6			
	Pre = x = 4%		Post = 9%		Pre 11%		Post 7%	
	Difference = + 5%				Difference = - 4%			

Reliability: Mean = 97%
Range = 85 to 100%

Appendix R

Study 9: Teacher Data

Mean Frequencies of Teacher Behavior per Fifteen-Minute Observations:

Experimental Group

	$\bar{X}$ #Trials		$\bar{X}$ #Models		$\bar{X}$ #Prompts		$\bar{X}$ #Reinforcements		$\bar{X}$ #Behavior Management	
Teacher	1:1	GRP	1:1	GRP	1:1	GRP	1:1	GRP	1:1	GRP
A	30	29	10	2	27	18	32	28	3	4
B	14	39	1	0	24	18	11	23	3	2
C	19	25	1	4	33	32	15	23	1	12
D	15	12	7	3	32	24	23	15	10	7
E	36	28	19	1	30	32	30	49	2	44
F	23	14	6	1	73	82	43	57	11	12
Ranges	6-45	6-47	0-31	0-7	5-107	2-126	4-57	8-74	0-23	0-68

N = 19

Number of Observations: 1:1 = 41
GRP = 73